

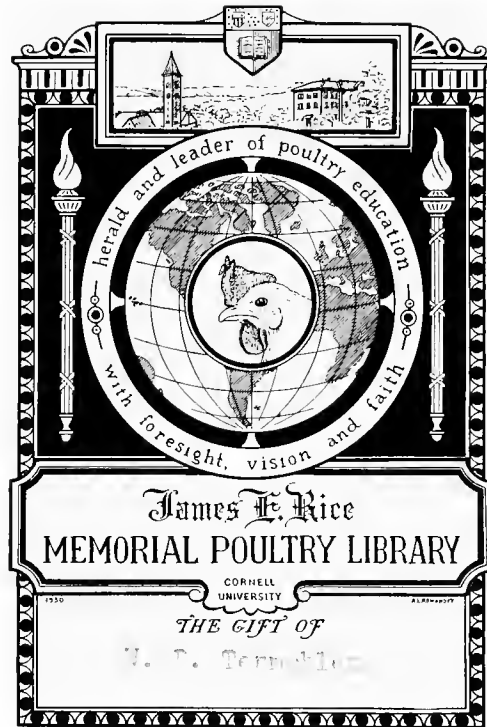
POULTRY KEEPING

AS AN INDUSTRY

FOR FARMERS AND COTTAGERS

EDWARD BROWN, F.L.S.

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**POULTRY-KEEPING AS AN INDUSTRY FOR FARMERS
AND COTTAGERS.**



Photo, T. C. Bejnon.

RANGE OF SCRATCHING SHEDS, COLLEGE POULTRY FARM, THEALE.

[Frontispiece.]

POULTRY - KEEPING

AS

An Industry for Farmers and Cottagers

BY

EDWARD BBROWN, F.L.S.

Secretary of the National Poultry Organization Society ; Lecturer on Aviculture at the University College, Reading ; Author of "Industrial Poultry-Keeping," "Poultry-Fattening," "Pleasurable Poultry-Keeping," etc., etc. ; Special Commissioner (1888) of the "Weekly Freeman," Dublin ; Judge of Poultry at the Royal Agricultural Society's Shows

EIGHTH EDITION

London

EDWARD ARNOLD

41 & 43 MADDUX STREET, BOND STREET, W.

1912

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P R E F A C E .



IN the last edition of "Poultry-keeping as an Industry for Farmers and Cottagers," I expressed the belief that, in respect to poultry-keeping as a practical pursuit, we were "on the eve of great developments, especially in egg-production," although it was too early to speak of them, as they were in the experimental stage. That belief has been abundantly justified. Within the last few years the increase of poultry-keeping, more especially of an intensive nature, has been phenomenal. Establishments are increasingly to be met with in which breeding and production are upon a much larger scale than ever attempted previously, and in some of these considerable capital is involved. Results will depend, as in all commercial enterprises, upon knowledge, determination, and skill, but we have proof enough of the possibilities to show that, given these factors, success can be achieved. The term "poultry-farm," so long misapplied, is now understood, and "poultry-farming" may be recognised as a most important—by which is meant a profitable—branch of agriculture. At the same time, the extension of poultry-keeping as a department of farming has, in many parts of the country, progressed at an increasingly accelerated rate. For many years development in that direction was our main objective, and it is satisfactory to note how much greater is the attention paid to poultry by farmers, many of whom recognise, as they have never done before, that an industry which can, by proper attention and skill, be capable of securing quickly gained cash, without interfering with other sections of the farm economy, and yield adequate profits, is worthy their time and thought. At the same time, however, we cannot fail to recognise the advance in production upon farms that are specially devoted to poultry-breeding.

My estimate is that, since the first edition of this work (1891) was published, the production of eggs and

poultry has increased in Great Britain to the value of £2,000,000 per annum, and in Ireland to the value of £600,000 per annum. This large addition to the incomes of farmers and cottagers has been secured without that direct aid from the State so freely granted in our colonies and foreign countries. It is due to the steady, persistent work of Agricultural Colleges, and of County Councils through their Technical Instruction Committees, to the influence of agricultural and other societies, and to the dissemination of information through the newspaper press. A new generation has sprung up, unfettered by past traditions and prejudices, and stimulated by foreign competition to efforts in avenues formerly untrodden. It is to that new blood in agriculture that we must look for further developments, and to the trend back to the land of men and women who are commercially inspired, though town-bred. Even with the advance indicated, there is much to be done. In Great Britain it is probable that there are not more than 750 fowls, and in Ireland 1,300 fowls, per 1,000 acres of cultivated land. In each country we could increase threefold without displacement of any other stock or crop, thus adding nearly £19,000,000 per annum to the earnings of our people. But the time for that growth is not yet.

The changes indicated have necessitated an almost complete revision of this work, which is now greatly changed and extended. Old ideas have had to be reconsidered, new experiences to be recorded, enlarged possibilities to be provided for. At the same time, our knowledge has increased both by observation at home and abroad. We should be willing to learn from everyone and everywhere. Moreover, developments in all branches of science and practical agriculture should be brought under contribution, and questions which at one time were regarded as outside the study of poultry-keepers can now be made helpful.

Many of the following chapters have been rewritten to bring them into relationship with present-day experience. That on "Poultry-culture at Home and Abroad" embodies later observations personally made in several European countries; the question of "Houses and Housing" has received much larger treatment, enabling me to deal fully with the newer forms of portable houses, and also the scratching sheds, as well as the true hygienic principles of housing. In connection with "Hatching and Rearing," both as to newer forms of incubators and brooders, and the dry system of feeding chickens, the subject receives fuller treatment. The chapter on "Feeding" is greatly extended, as are those of "Fattening," "Duck-farming," and "Turkey-farming"; and a considerable addition has been made to the chapter dealing with "Production and Preservation of Eggs." New chapters have been added dealing with "Climate and Soil in Relation to Poultry-culture," "Marketing the Produce," and "The Economics of Poultry-keeping," thus making the work complete and capable of meeting modern requirements. A large series of new illustra-

tions has been introduced, with plans, in many cases, from photographs supplied by the owners. These have necessitated omission of the plates of breeds, which will be included in an entirely new companion volume.

Acknowledgment is made of courtesy received, either in the shape of photographs or blocks—in addition to those noted in the imprints—to Mr. T. C. Beynon for the Frontispiece and Fig. 64; to Messrs. C. E. Hearson and Co. for the beautiful series illustrating the embryonic development of the chicken (Figs. 28 to 38); to Messrs. Barnard, Bishop and Barnard for Figs. 6, 15, and 48; to Mr. W. Reynolds for Figs. 10, 11, and 12; to Mr. W. W. Greenwood for Fig. 16; to Messrs. Boulton and Paul for Fig. 17; to Mr. W. Calway for Figs. 18, 25, 26, and 49; to the Editor of the *Agricultural Gazette* for Figs. 62 and 98; to Mr. R. Meech for Figs. 72 and 104; to Mr. J. P. Chalmers for Fig. 81; to the Editor of *The World's Work* for Figs. 99 and 100; to the Editor of *Feathered Life* for Fig. 103; and to Messrs. Freemans and Green, Limited, for Fig. 105.

EDWARD BROWN.

THE CHESTNUTS,
THEALE, BERKS,
May, 1904.

NOTE TO THE SIXTH EDITION.

IN the first edition my intention was announced of writing a companion volume dealing exhaustively with the breeds and varieties of poultry. The task proved greater than I then anticipated, involving a vast amount of research and observation. To that end I have visited nearly all the European countries, and discovered many races unknown to British and American breeders. Under the title of "Races of Domestic Poultry" a volume is now ready, uniform with the present, containing a large amount of new information bearing upon the economic qualities of all the known members of the four species included in the term of Poultry.

EDWARD BROWN.

February, 1906.

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POULTRY-KEEPING AS AN INDUSTRY

FOR FARMERS AND COTTAGERS.

CHAPTER I.

POULTRY-FARMING, AND WHAT IT MEANS.

WHAT IS POULTRY-FARMING?—AS AN ACCESSORY—PROFIT REALIZED—SEPARATE POULTRY INDUSTRIES—RECENT CHANGES—DISPOSAL OF PRODUCE—SOURCES OF FOREIGN SUPPLIES—IRISH EGGS AND POULTRY—WHAT POULTRY-FARMING MEANS—POULTRY AN ADDED CROP—COUNTY STATISTICS.



POULTRY-KEEPING as an industry is so important a subject that it is essential at the commencement we should clear the ground of all prejudice and indicate the real meaning of terms employed.

Unless this is done, the probabilities are that we shall be misunderstood, and our subject misconstrued. In no branch of stock-keeping is this more likely to be the case than with poultry. Hitherto it has been a commonly accepted axiom that "poultry do not pay," and as profit in one direction or another is essential to the success of any commercial enterprise, unless we can give good reason for the belief within us, it is scarcely possible to command attention. To disarm those who are wedded to the idea that poultry-farming does not pay, we at once declare that this is our belief, confirmed by observations at home and abroad, if conducted upon the lines heretofore followed. Then why, it may be asked, trouble to recommend a pursuit which fails to fulfil the purposes of all undertakings of this nature? Farmers have been only too familiar with lack of profit, and do not conduct their business with any philanthropic motive. For them it is of supreme importance that the balance shall be on the right side of the ledger. To these statements we would reply that it is entirely a question of what is meant by poultry-farming. Commonly accepted, it denotes the conduct of a separate business, such as fruit-growing, and the attempts made to establish large poultry-farms, which have been many, show a long record of

failures. Many of these experiments have been conducted with considerable energy and at great cost. Others have been damned at the outset by the inexperience of their authors, who have been led on by misleading statements and by the fascination of statistics made to prove that poultry-keeping was the highroad to fortune. In the sense, therefore, of these attempts, we are at one with those who declaim against poultry-farming, for we do not believe the elements of success are contained in this pursuit conducted under such conditions. How, then, can it be made a success? Our reply is: By employing it as part of the farmer's operations, one of the many departments of his work, the combination of which enables him to attain that result for which he seeks.

It is in this spirit that we approach the subject, and our object is to show farmers and cottagers that in poultry-keeping there is money to be made—money which is now poured into the pockets of their foreign rivals, who could not hope to compete with them if they took up the pursuit with enterprise and skill. On the lines we intend to lay down there are many successes to be recorded. Farmers in various parts of the country can be found who regard poultry as an important branch of their work. In Devon and Cornwall poultry-breeding and egg-production enter into farm work to a greater extent than is, perhaps, the case in any other English counties, and there form an important element. In Surrey and Sussex, in Buckinghamshire and in Lincolnshire, much is already

done; while to an increasing extent throughout the country we find farmers and others who are alive to the value of poultry breeding, and have developed this branch of their pursuit to a considerable extent. Reference is specially made to this in Chapter II., dealing with the subject of farm poultry at home and abroad. It would be very interesting to give a series of balance-sheets showing the results of poultry-keeping upon farms, but want of space forbids our doing so. As an example, however, of commercial management of poultry upon a farm, one of the most useful contributions to a solution of the problem as to whether poultry-keeping can be made to pay has been given by Mr. Walter Palmer, M.P., in a book published by him a couple of years ago, entitled "Poultry Management on a Farm."* This brochure gives an account of three years' work, with practical results and balance-sheets. In the introduction Mr. Palmer says: "The questions are repeatedly raised when discussing this subject: Do poultry pay on a farm? Why have so many failures occurred? If successful, how can it be done? What are the essential conditions? The review which I venture to present to the reader is the answer which my own experience has given me to these questions, and which I offer for the consideration of those who are interested. I make no attempt to discuss the general subject of poultry, a knowledge of which can be acquired from many well-known books. My object is, by presenting the facts of my own case, to arouse an interest on the part of land-owners and farmers throughout the country, who need not necessarily be acquainted with the many details relating to poultry. I suggest that the time for scepticism has passed, and that the time has arrived when the benefit to be derived from poultry-farming should be regarded in a more serious light." The balance-sheets show that for the year ending September 29, 1899, the profit was £33 17s. 6d., which, on a valuation of £236 2s. 10d., works out at 14 per cent.; for the year ending September 29, 1900, the profit of £68 5s. 6d. on a capital of £399 12s. 10d. equals 17 per cent.; for the year ending September 29, 1901, the profit of £83 12s. 9d. on the valuation of £647 1s. equals nearly 13 per cent. If these results can be achieved upon a farm where all the labour has to be paid for, it will be seen that under like conditions farmers, especially those occupying smaller areas of land and who perform a great deal of the labour themselves, should be able to greatly increase the profit obtained. Such is undoubtedly the experience of many throughout the country. Unfortunately, however, the great majority of farmers do not keep accounts so carefully, and are unable to state the profit made.

* "Poultry Management on a Farm: an Account of Three Years' Work with Practical Results and Balance-sheets." London, 1902.

SEPARATE POULTRY INDUSTRIES.

It may here be explained that in the United Kingdom there are several specialized branches of poultry-keeping, notably the raising of ducks and the fattening of chickens, both of which are undoubtedly profitable. Within the past few years, however, we have seen considerable developments in other directions, and there are now springing up in different parts of the country a number of what may be fairly termed "poultry-farms." These are, however, conducted in accordance with the principles which have already been laid down—namely, in association with cultivation or farming in one direction or another. Although under such conditions poultry form the great objective, and other branches are only adopted in order to meet the requirements of, or are supplementary to, the poultry. Such establishments, as a rule, combine production for marketing purposes with the sale of stock birds and eggs for hatching, and although it is yet too early to form a definite opinion as to how far they can be extended, our experience is sufficient to warrant us in believing that this branch of poultry-keeping will develop very greatly throughout the country.

IS POULTRY-FARMING PROFITABLE?

The expression "poultry don't pay" has been common for a long period of time, and is still so to a considerable extent. All the facts which can be brought forward go for nothing when once a set idea of this kind enters into the minds of people. It is interesting to note, however, that those who use such an expression are generally the older folk, who, drawing upon their experience, or want of experience, of forty to fifty years ago conclude that what was true then is necessarily true to-day. They forget that the conditions have changed, that our knowledge has advanced, that experience has greatly broadened, and also that, in this country, at any rate, food for poultry has cheapened to an enormous extent. In fact, it cannot be denied that the development of poultry-keeping has been made possible by cheap food. Some time ago we listened to a discussion between a farmer and his son. The farmer condemned poultry-keeping, which the son had developed to a considerable extent, and he declared that it was simply waste of effort and of money. The son, however, respectfully and very firmly replied: "Father, ever since I can remember you have been complaining that farming has not paid, that the methods which in your earlier days were successful are no longer so, and I have never seen anything of prosperity on the lines along which you have worked. I am now trying my own way to see whether this will not meet the requirements and conditions of the times." This is the spirit in which we should approach the question, because any nation or people who fail to constantly strive in new directions is bound to succumb.

Those who state that poultry do not pay have forgotten the great changes which have passed over agriculture of late years. Within the last twenty-five years more and more has agricultural land been laid down to pasture, and corn lands reduced in extent. That in itself offers an opportunity for the increased keeping of poultry, although, as we shall afterwards show, fowls do not injure growing crops in the way which is generally supposed. Further, the adoption of other branches of cultivation, such as fruit-growing, has afforded a considerable opportunity for the development of the industry. In the fruit-growing districts full advantage is not yet taken, nor is it sufficiently recognised that fowls render a great service in keeping down those forms of parasitic life which are encouraged as the result of intensity of cultivation. Many cases could be given, were it necessary, indicative of the benefit arising from running poultry in orchards and fruit-gardens, and we have only to look at what is done in Normandy, where in the great apple-orchards poultry are kept to such a large extent. But by many British farmers fowls are looked upon as a necessary nuisance, a few of which kept about the farm will help the good-wife to a little pocket-money and supply the household needs in the way of eggs and chickens. We must, however, approach the question from a different standpoint. It has been proved again and again that not only will poultry contribute largely to the incomes of farmers, but at the same time render him service in other ways, both in cleaning and manuring the land. As already stated, the reduced cost of feeding is a very important question. One of the difficulties in respect to agriculture has been the reduction in price of corn. That, however grievous the fact has been, has stimulated the feeding of stock, and eggs and chickens can be produced at a less cost than was formerly the case. On the other hand, there has been no reduction in the returns. Eggs of the best quality have never been higher in price than at the present time, and all the better classes of table poultry maintain their value.

EXAMPLES.

It is an interesting study to discover the origin of certain sayings, such as the one we have already noted—namely, that “poultry don’t pay.” In this connection it is better to frankly recognise that there have been many failures in the past. The last fifty years have seen the commencement of many enterprises, in which large sums of money have been invested—either privately or in companies—for the breeding and rearing of poultry, but they have without exception come to grief. In almost every case those who undertook the management had no previous experience of handling birds in great numbers, and they were lacking in knowledge of what may be termed general agriculture. It must be borne in mind that, as a rule, profits on large enterprises are

nearly always smaller proportionately than where personal effort is put forward and the work undertaken is within the compass of the individual. We are convinced, however, that the chief reasons why these failures have taken place have been that, instead of making poultry a part of the stock and a branch of the farm work, recognising that there are natural laws in respect to soil, etc., which cannot be abrogated, these have been utterly ignored. Such failures, however, are valuable as showing us what to avoid.

From observations in all parts of the country, it is an undoubted fact that poultry-keeping upon farms has been for many years a much more profitable branch than is commonly supposed. In many districts, both at home and abroad, the custom has been for the farmer’s wife to take the poultry into her charge, making the best she could of them, keeping the money obtained for her own purposes, for clothing herself and children up to school age, and also for meeting minor household expenses. This custom in itself has not tended to that economy which is desirable, because the good-wife had claim for sufficient corn, and, as it cost her nothing, her business was to force returns on the one hand, or on the other to ignore a proper relationship between expenditure and income. But a further point is that those who have said that poultry will not pay are usually the men, and they did not know anything about it. In many cases the income of the wife from the poultry is very much greater than her husband imagines, and she, like a wise woman, realizing that if he thought she was obtaining a considerable sum would then think it about time for him to have a share in it, does not let him know what she makes. We know cases where £100 a year is obtained in this manner; but, unfortunately, in many instances the cost of food cannot be stated, and hence it is a very easy thing to say that the business is unprofitable. We can, however, state that where the husbands are sympathetic and do not begrudge the earnings of their wives, realizing that this is a saving to them in the long-run, although they never handle the money, and where a proper account is kept, it can be shown that the result is profitable. Some time ago we were visiting a farmer in one of the Ridings of Yorkshire, whose wife keeps about 200 head of poultry. The appointments, so far as housing the poultry was concerned, were very primitive, and might have been improved with great advantage; but the stock management was, on the whole, satisfactory. A very careful account of expenditure and income had been kept for three years, during which time the average sales of eggs and chickens had been £95, varying from £93 to £97 per annum. As to expenditure, all corn used had been booked against the poultry, and at prices which it would have realized in the market, or the value if it had been used for other kinds of stock feeding. Although a new house and an incubator had been

charged to the current account, the average profit for the three years referred to was upwards of £50 per annum. Of course, no labour was charged, and that would have been unfair in this case, as the £50 was a reward for labour, and well paid for at that. Another instance, taken from one of the South-Eastern counties, will be sufficient for our purpose. In this case a large farmer had taken up the breeding of chickens, which he sold when about three to four months old to the higglers for the fattening establishments. His breeding stock numbered fifty birds, and from these he had sold in twelve months £87 worth of chickens. Those who are acquainted with agriculture will know that the margin of profit must have been considerable, and the farmer himself said that the net profit was upwards of £50. We could give many instances of a similar nature, some on a larger scale, but the general difficulty is that few of those who go in for poultry-keeping on farms keep a careful account, any more than they do in other branches. If a farmer says that he reared a young colt which he sold at three years old for £50, of course everyone realizes that a considerable part of this must have gone in expenses; that, however, is understood, and so it must be in the case of poultry. Then we have other instances, about which we shall have to say more later on. But it is a fact which cannot be gainsaid that over wide areas poultry-keeping is carried on to a considerable extent, and though actual figures may not be available, everyone understands that the poultry add considerably to the income. It must, however, be noted that the people who make poultry-keeping pay best are those who undertake the work of management to a large extent themselves, and we cannot ignore the fact that this industry is more profitable on medium and smaller sized farms than those of 500 acres and upwards.

We desire in this connection to say a word or two with regard to another branch—namely, duck-farming. It has been claimed that there is no duck farm which pays. Let us for a moment try to fix our ideas as to the term used. When we speak of a duck farm, we mean one where duck-breeding is the leading or one of the leading features, but certainly not that it is the only work done. If anyone had, say, 200 acres of land, and upon that he kept 2,000 fowls, it could fairly be termed a duck or poultry farm, whichever it was; but we should expect that the farmer would probably use part of his land for hay, and, if it were in an arable county, that other areas would be utilized for roots or corn. In the same way we speak of a dairy farm. Accepting the definition of the term which we have laid down, it is a provable fact that this industry is now being carried on to a considerable extent, and profitably. We shall afterwards say something as to a farm in North Lancashire, where, in 1903, 35,000 ducklings were hatched, reared, fed, and killed, and

of other places where as many as 10,000 have been marketed per annum in the same manner. Nor has this work been carried out for a year or two only, but for a period of years, with results which are evident to those who have inquired into the matter. The fact is, the glib observation that "poultry don't pay" has so blinded the minds of many people that they absolutely refuse to accept positive evidence at hand.

More than twenty years ago, when we first took up this question with a view of seeing how far the poultry produce of the country could be increased, after careful observations we came to the conclusion that those who had the greatest opportunities of making poultry farming or keeping—whichever term is employed—pay best were the agriculturists of the country, and the efforts put forward at that period and since have been to improve the quality of the poultry upon farms, to increase their number, and to secure the adoption of methods of management and of marketing which would yield adequate returns to those who took up this branch of live stock. Although much remains to be done, it can fairly be claimed that a great deal has been achieved, and the condition of home produce in this branch is vastly superior to what it was even ten years ago. As a branch of agriculture many expenses which would otherwise have to be met where the poultry-keeping is a separate industry are avoided. For instance, there is the question of rent. It would be unfair to charge rent to the poultry when the land is used for other purposes, and this is also true in the case of labour. Only as much of the labour should be debited to the poultry account as would not be required if they were absent. And, further, we have to take into consideration that poultry can utilize food that would otherwise be wasted, and in this way render a service which is appreciable in the final balance-sheet of the entire farm. There is also the question of manure, for it has been shown that a fowl of the ordinary size will produce nearly 100 pounds of manure in the twelve months, and upon the basis of analysis made by one of our most famous chemists, Dr. Voelcker, the individual manurial value per fowl upon a general farm is equal to something like 1s. 6d. per annum. We claim, therefore, that this industry should be encouraged, not in the form of huge enterprises, but as an addition to our ordinary farming, and that it deserves the support of landowners and tenants equally. We know that poultry are troublesome in some directions. For instance, they are fond of scratching about the hedgerows, and therefore certain farmers do not like them; but the benefits accruing from them in other ways much more than compensate for any additional labour involved.

RECENT CHANGES

It is generally acknowledged that until recent years poultry-keeping in many districts was a neglected

pursuit, and there was no systematic treatment of the poultry as part of the farm stock. This is somewhat surprising when we find that ever since man became settled poultry have been kept as a means of producing part of his food. In some cases, both in ancient and modern times, we find that special industries have developed. Amongst ancient writers, Columella and Pliny tell of the production of poultry in Italy nearly 2,000 years ago, and the older writers upon agricultural topics in England, from Willughby to Arthur Young, describe districts in which there was a great amount of attention given to poultry-keeping. It was not, however, until civilized men increased greatly in number, and especially until they became concentrated in towns and cities, that the demand for poultry produce increased to an extent greater than could be supplied in the ordinary way. Spite of this fact, in nearly all cases poultry were regarded as a minor product, and at one period the demand was confined to given periods of the year and to a limited number of people. One of the French Kings expressed the hope that at some time every French peasant might have a fowl in the pot, but until quite recently fowls were regarded as a luxury, and eggs seldom used except in the houses of the well-to-do. With the growth of population, however, with the increasing wealth and comfort of the people, and with the advancing incomes of our industrial classes, the consumption of both eggs and poultry has enormously increased. We do not think that it is generally recognised, but there can be no question that the tendency in all civilized communities is towards finer and better articles of food, displacing the heavier meats and puddings of former days. It is very evident that differing conditions require different foods, and the man whose life is spent in the open air, probably accompanied by hard physical exercise, is able to assimilate foods which would be altogether unsuited to those whose life is spent either in sedentary pursuits, or in close factories, shops, or offices. The latter need food that, whilst nutritious, can be easily digested, and also it is a most suggestive fact that the increase of education in every country is accompanied by a greater demand for what may be termed the lighter articles of food. It is evident that the development of any part of the body will require food suitable to its support, and we believe that the increased use of the brains of our people as a consequence of advancing education has had more influence than is generally supposed in creating a demand for eggs and poultry.

Other changes have had their influence. In the days prior to the time when our cities and manufacturing districts had increased to so great an extent, the old system of producers and consumers meeting together in local markets was almost universal. It is now practically confined to a few counties. Also the concentration of farms and the decreased number of smaller farms means that in many cases less attention

has been given to butter and eggs and poultry, and that farmers' wives under these circumstances do not stand in the local markets offering their produce for sale. One of the most serious hindrances to the development of poultry-keeping as part of the farm stock has been the social arrangement between farmers and their wives, by which the poultry were left in the hands of the women folk. In many cases they have done the best possible under the circumstances, but with household duties, and often growing families, it was impossible for them to develop beyond a limited extent, and the fowls must be kept around the homestead. We have now arrived at the point when such arrangements must be abandoned. Poultry-keeping is no longer a perquisite for the women or the younger members of the family; if they can take it up on commercial lines, extending as required, then there is no reason why they should not do so; but it is a business, and must be dealt with upon business principles. In fact, those who undertake the work must make it the first object of their attention, and be prepared to give their time and thought to its development. We have seen the same influence operate in connection with dairying in many parts of the country, and though it may be regretted that this perquisite should be taken away from the farmers' wives and daughters, the dairy industry could never have been developed under former conditions; and what is true in that direction is equally true so far as poultry-keeping is concerned.

DISPOSAL OF PRODUCE.

Apart altogether from other considerations, one of the first questions which must naturally arise in connection with the probable success of poultry-keeping is the opportunities for disposal of the produce and the price that can be obtained for it. In several departments of farming the great reason for the long period of depression has been severe competition from abroad. All businesses are subject to such fluctuations, either by diminution of demand or reduction of returns through excessive supply. This has been so in corn-growing and other branches of agriculture, but to-day the best qualities of eggs and chickens are as dear as ever they were, and 50 per cent. more costly than was the case a generation ago, so far as the consumer is concerned, for, unfortunately, all does not go into the pockets of the producer. Still, in many districts the producer does obtain more for his goods than did his father, much less his grandfather. Together with this fact it must be noted that food for his flock is at a lower figure, and hence it cannot be claimed that poultry will not pay. With the advance in price has come an enormous increase in demand. It is not only that there are more people to eat eggs and poultry, but people eat more of them. Where one egg was consumed thirty years ago, ten are probably used now. For one chicken purchased then, probably half a dozen

are now eaten. In the Appendix* will be found figures showing the consumption of eggs and poultry in this country. It is very evident that there has been a very great growth in home production, and it is estimated that in the year 1903 the production was greater by £2,600,000 than in 1890. Of this large sum, £2,000,000 would represent the increased production in Great Britain, and £600,000 in Ireland. The increase in consumption noted, which does not take into account the growth of foreign imports, is due to the greater purchasing power of the community far more than to the growth of population, and there is every indication that the consumption of eggs and chickens will advance quite as rapidly in the future. The total consumption of eggs in the United Kingdom is at the present time about 100 per head of the population, but when we eliminate from this calculation Ireland, which is a producing country, and in which the consumption is undoubtedly much less per head than in Great Britain, the average number consumed by each individual would be about 115 per annum. When it is remembered that this is just over two eggs per week for each person, it will be seen that the capacity for growth is very large indeed, and probably the time is not far distant when the consumption will be increased two- if not three-fold.

SOURCES OF FOREIGN SUPPLIES.

The volume of imports from other countries has very rapidly increased of late years, and the tendency is year by year to advance even at a greater ratio than has previously been the case. In the Appendix† will be found tables showing the growth of imports, and also the countries whence supplies are received, these being taken from the Trade and Navigation Returns. Of the eggs received, the best in quality come from France, that country being able to send its produce to our markets in the shortest space of time. Of late years, however, there has been a considerable falling off in French supplies, probably arising from an increased consumption in that country, and also that the position formerly held upon our markets by the finest qualities of French eggs is now occupied by home produce. French eggs are chiefly consumed in London and the South-Eastern counties. The Danish supplies stand next in point of quality, and they are sold largely in the Northern and Midland counties of England and in Scotland, where they have in many places taken the position formerly held by the Irish. Large quantities of eggs are received from Italy and Austro-Hungary, but the greatest number of foreign supplies come from Russia, which country now sends us annually this produce to the value of upwards of £3,000,000. It must be observed in connection with the tables referred to that the returns given as to Belgium, Germany,

Italy, and Russia are misleading, because we receive practically no eggs whatever produced in Belgium and Germany, although the Trade and Navigation Returns credit them with large quantities. The custom is to credit with the supplies the last country through which the shipments pass, and not the country of origin. Hence, although the tables are interesting, they by no means fairly represent the true facts of the case. A large proportion of the eggs credited to Germany come from South Russia and the balance from Austro-Hungary, whilst practically all the Belgian eggs are from Italy.

VALUES OF IMPORTED EGGS.

With so perishable an article of food as eggs, in which freshness is primarily important, as may be expected, the quality varies considerably. This is seen in the declared values, which, however, can scarcely be regarded as altogether reliable. Still, they are indicative of relative qualities, and the following are the average values per great hundred for 1903, taken from the Trade and Navigation Returns.

	s.	d.
Russia	6	5½
Denmark	8	6¾
Germany	6	5¼
Belgium	6	4½
France	8	4¼
Canada	7	10
Other countries	5	11½
General average	6	8

These figures clearly show that distance from the British markets, and consequent decrease of freshness, determine the prices at which the eggs are sold. Although it would appear that Canadian hold a high position, they generally arrive during the last three months of the year, and therefore the figures given with regard to them are misleading. In fact, if a series of circles were drawn, with London as the centre, at distances of 250 miles, we could by this means almost indicate the values of the eggs therefrom. With every circle the price which they realize upon our markets would decrease. Upon this question, however, more is said in the chapter dealing with the marketing of eggs.

IRISH EGGS AND POULTRY.

Considering that Great Britain is the consuming section of the kingdom, it is necessary that we should deal with the supplies from Ireland. During the inquiry which the writer conducted on behalf of the *Freeman's Journal* of Dublin in 1888, it was estimated that the exports of eggs and poultry from that country to Britain amounted in value to £1,613,000. Since that time the number of fowls kept in Ireland has increased

* Appendix A.

† Appendix B.

enormously, and it is estimated that the export of these two articles of food is now in value £2,300,000 per annum, greater than the supplies received from any other individual country except Russia. For a considerable time it appeared as if the Irish egg and poultry trade would be hopelessly beaten, due to the antiquated methods adopted. In that respect there is still much to be done for improvement, but since the last edition of this work was published the Department of Agriculture has been organized, and now in a great many of the Irish counties instruction is given in poultry-keeping. In some of these counties what are called premium farms have been established, at which experimental work can be carried out, and from which breeding stock and eggs for hatching are distributed to the farmers in the county for the purpose of improving their poultry. In addition, the Irish Agricultural Organization Society has promoted the establishment of local societies, the object of which is to collect and market the eggs, and in some cases to obtain the lean chickens and fatten them. We may therefore anticipate that there will be a considerable growth in Irish supplies, not only in quantity, but also in quality; and if that is so, probably ere long Ireland will be able to supply us with both these products of such a quality as only to be excelled in the case of eggs and poultry produced close to the point of consumption. Ireland is a country of small farms, and with the great changes through which it is now passing, we hope to see the realization of that object which was in our mind in 1888, when we took some of the earlier steps for the development of the poultry industry in the Green Isle. There is no country in the world that can produce better eggs and poultry than Ireland if the work is conducted in a proper and businesslike manner.

WHAT POULTRY-FARMING MEANS.

In all operations it is most important that there shall be a definite object, and this is certainly true in the case of poultry-keeping. A man is a poor creature who starts life without any ideals, and it is essential that everyone who takes up this industry should have some objective towards which he can strive. The ideals may have to be modified and the methods be changed, but it is better to do this than to go on the old haphazard methods which have proved so fatal. We must in this direction realize the principles which are before us, and as far as possible strive for their attainment. At the same time, it is necessary to realize our limitations, and in many directions these are much greater than might be imagined. If a farmer is prepared to scatter his fowls about the land, he will practically only be limited by the labour available for their management; but where fowls are kept within enclosures or immediately around the homestead, the number must be restricted in accordance therewith. Some

time ago we visited a farmer who keeps regularly about 1,200 head of laying hens; he has a mixed farm of nearly 800 acres, and his experience has been that, taking into account the rotation of his crops and the oversight of the poultry, he cannot exceed the number stated above. Once or twice when he has attempted to do so he has found that the loss was greater than the gain. A further point in this connection is, as we shall show in a later chapter, that the branch of poultry-keeping taken up must be suited to the soil and to the position. There are many districts which are altogether unsuited to the production of table poultry, and yet are eminently suitable for egg production. On the other hand, there are districts which would be favourable for ducks or geese, and unsuitable for turkeys. Everyone, therefore, should study the local conditions, and, whilst endeavouring to extend operations, as far as possible avoid those initial mistakes which are so difficult to overcome, and especially attempting what is unsuited to the local soil and conditions.

POULTRY AN ADDED CROP.

In face of the statistics given in the Appendix, it is impossible for anyone to pretend that the question of poultry-keeping is beneath the notice of farmers and cottagers, and it is pleasing to see that many are awakening to this fact. We do not assume that £5,000,000 or £10,000,000 will save the agriculturist from ruin, but it would materially help him in his difficulties; and there are cases which could be cited where the fowls have been the means of keeping the home together during the stress of the last few years, whilst in others they have given opportunity for a new industry. As Dr. Fream has so well shown, "the rearing and fattening of poultry—including fowls, ducks, geese, and turkeys—as well as the output of eggs, might be very largely extended at home without displacing any other kind of produce."* In fact, a further crop can be obtained without interfering with any present operations, and in many cases helping them. But the benefit is not only to be measured by the amount of money earned, for the work done by fowls in the way of manuring and cleaning the ground is incalculable. Farmers have a golden opportunity in this direction, but it is equally important that cottagers and labourers should advance in a like manner. In some districts, unfortunately, restrictions are put upon their keeping poultry, which are greatly to be deprecated. These, however, are chiefly in the corn-growing counties, and arises from a fear that food will be stolen for the fowls. Elsewhere there need be no danger of that kind, and the money which cottagers and labourers can make by keeping a few fowls would do much to make their lot in life brighter and better.

* *Journal of the Royal Agricultural Society*, vol. 7., part ii., third series.

One man informed us that he had made enough from his poultry to pay his rent, which meant 20 per cent. added to his income.

COUNTY STATISTICS.

It will be remembered that in 1885 and 1886 an attempt was made by the Board of Agriculture to obtain statistics of poultry in Great Britain, but was afterwards abandoned. These statistics are, however, secured in Ireland and in France as well as in America, and it may be hoped that the feature will be again introduced into the agricultural returns. Without it we are largely in the dark as to home production. What can be done elsewhere is surely capable of accomplishment in Britain, and we cannot too strongly urge its reintroduction. The returns for the years named show that in England there were 493 fowls per 1,000, acres of cultivated land; in Wales, 487; in Scotland, 480; in Ireland, 1,099. The estimated increase of poultry upon the farms of the United Kingdom would show that at the present time the number of

fowls per 1,000 acres of cultivated land are as follows:

England	...	...	...	745
Wales	...	...	...	610
Scotland	...	...	...	613
Ireland	...	...	...	1,197

As we believe that both in Great Britain and Ireland it would be possible to keep upon the farms of the country two fowls per acre of cultivated land without displacement of any other stock or interference with any present cultivation, it will be seen that there is much to be done before production in any sense meets the market demands. We calculate that at the present time the production of eggs in the United Kingdom is in value £6,500,000, and of poultry £3,100,000, or a gross total of £9,600,000. Were poultry kept to the extent indicated above, this large sum would be doubled. It should be the object of all those who are interested in the welfare of the country to take advantage of the opportunities afforded, and increase the returns in the way here indicated.

CHAPTER II.

POULTRY CULTURE AT HOME AND ABROAD.

POULTRY A NEGLECTED QUANTITY—EXHIBITION POULTRY—ENGLAND—SCOTLAND—WALES—IRELAND—FRANCE—
BELGIUM—GERMANY—DENMARK—ITALY—AUSTRO-HUNGARY—RUSSIA—OTHER EUROPEAN COUNTRIES—BRITISH
COLONIES—UNITED STATES OF AMERICA—SUMMARY.



UNTIL recent years, with a few notable exceptions and in special districts, the farm poultry of this country has been a very neglected quantity. For more than fifty years, however, poultry culture has received a considerable amount of attention, but distinct from general farming. This was due to the establishment of the exhibition system. It is not our purpose in this work to deal with what is known as "the fancy," but in a review of the present position of the poultry industry, it is impossible to ignore the great influence of breeding for the show pen upon the races of poultry and also their productiveness. But for the fanciers who, at a time when farmers practically gave no thought whatever to the improvement of their poultry, took up the work, the position of our fowls and of the pursuit would be distinctly lower than is now the case. All over the country breeders of exhibition fowls are to be met with, generally those whose opportunities in the way of land are restricted; but they have preserved, and in some cases introduced, varieties of fowls which are among the best for economic purposes. On the other hand, there can be no question that they have injured many breeds by excessive development of external characteristics—breeds which formerly were of great value economically. We must, however, leave this branch of poultry-keeping entirely out of our purview, as the object of fanciers was and is, not the production of eggs or poultry, but perfection of characteristics for exhibition purposes. That their influence has been on the whole beneficial we have no doubt whatever.

Looking at the question, therefore, entirely as a branch of agriculture, as a rule fowls were relegated to the farmer's wife and daughters, to whom in many cases every bushel of grain was either begrudged or regarded in the light of a contribution to the women-folk, enabling them to obtain sundry articles without

troubling their husband or father for the money. When and where farms were small, and the wife jogged weekly to market with her "good man," she carrying her store of butter and eggs, this arrangement was not of serious moment, for all the operations were upon a comparatively moderate scale, and poultry held a relative proportion to other products. But now a different set of conditions exists, and in face of the vast volume of foreign imports, as well as the needs of our people, it is necessary to rise to a higher conception of the question.

ENGLAND.

As we have already indicated, in certain districts poultry-keeping has always been carried out more extensively than elsewhere. We shall have from time to time to deal with branches in which specialization has taken place, speaking of the fattening industry met with in Surrey, Sussex, and West Kent; of duck-raising in Buckinghamshire and Bedfordshire; of egg production in Devon and Cornwall, and the border districts of Lancashire and Yorkshire; of geese and turkey breeding in East Anglia; and of general poultry-keeping in Lincolnshire and Cumberland. In the counties named poultry held relatively a much more important position than was general throughout the country, and its value was regarded as contributory to the general welfare of farmers. In other districts, however, as already mentioned, poultry-keeping was carried on without business methods and on haphazard lines. In fact, few farmers looked upon the fowls as deserving serious thought, whereas even under these circumstances in many cases the poultry were contributing more to the general income than anyone imagined. Of recent years, however, there has been a great awakening throughout the country, and in almost every county a considerable increase in the number of fowls kept is manifested, whilst there have

been great improvements in the breeds maintained and in the methods adopted. The introduction of the portable house system has made possible what would have been altogether incapable of realization before, and it is not too much to say that there is no country in the world where poultry are distributed to the same extent as in England. We have often been struck by the fact that even in countries like France, Belgium, and Denmark fowls are less in evidence when passing by the railway than in England. It is unnecessary for us at this point to indicate the counties where progress has been most manifested. Many of those which previously had given great attention to poultry have developed to a considerable extent, but probably the greatest extension has been in other counties. There can be no question that the introduction of technical instruction, and the lectures given under the auspices of the various County Councils, have had marked influence in this direction. It is estimated that since the first edition of the present work was published in 1891—the year, be it noted, when the County Councils were entrusted with technical instruction—the production of eggs and poultry in Great Britain has increased in value to the amount of nearly £2,000,000 per annum. It is interesting to note that the counties in which poultry-keeping has increased to the least extent are those where fox preservation is most manifest. We do not intend to discuss the question fully, but simply to say that it is in a very unsatisfactory state. There is no doubt that the preservation of foxes tends greatly to check the development of poultry-keeping, and especially to prevent the keeping of higher-class stock. In spite of that, however, even in the hunting counties a larger number of poultry are kept than formerly. The poultry fund is a very considerable tax upon those who enjoy this sport, and whilst full justice is by no means done to those who suffer loss by the depredations of foxes, in many cases these funds are depleted by bogus claims. There is no reason, however, why poultry-keeping and fox-hunting should not be conducted side by side. The evidence of Lord de Ramsey in Norfolk, and Mr. Walter Palmer, M.P., in Berkshire, and of many others, show that if proper care is taken on both sides foxes will not interfere with the poultry. What is required is that keepers shall be compelled to feed the animals during the cubbing season, and that poultry-keepers shall provide suitable houses, with runs attached, for their birds, taking care to close them up at night. In the chapter upon Housing special attention is given to the form of house most desirable under these conditions. In spite of this hindrance, the progress made in recent years has been very marked.

SCOTLAND.

So far as North Britain is concerned, there are no parts of that country where special branches of the

industry are met with; in fact, Scotland has not yet risen to the same extent as England to her opportunities in poultry-keeping, with one exception. Of late years there has been a considerable increase in the number of poultry kept in the Shetland Islands, and it is estimated that the value of the eggs sold is annually greater than the entire rental of the islands. There are, however, many difficulties to face in the direction of marketing. Throughout the rest of the country there is at the present time a fair amount of poultry-keeping, which has increased of late years, but the production of eggs is kept in view much more than table poultry. The portable house system has not been adopted in Scotland to the same extent as in England. Signs, however, are evident that a considerable change is taking place in this direction, and we may hope that the next few years will see a very marked advance. Throughout the districts surrounding Glasgow and mid-Eastern Scotland a considerable number of farmers have improved their poultry-keeping, but the branch has not been systematized to the same extent as might have been expected. In Aberdeenshire also there has been a decided improvement, and it may be noted that in North and North-East Scotland, as well as in the south-western parts of the country, the conditions are favourable for the development of table poultry, by reason of the nature of the soil and of the climate, due to the influence of the Gulf Stream. There is no doubt that if that branch were taken up a great deal might be done in the direction of increased poultry production. Ducks and geese are bred to a very limited extent, and turkey-raising in Scotland is practically confined to a comparatively small part of the south-west.

WALES.

No part of Great Britain is more suited to poultry-keeping than the Principality of Wales. It is a country of small farms, and therefore specially favourable to minor agricultural products, whilst its mountains, valleys, and plains offer a variety of opportunity which is met with in no other part of the United Kingdom. At the present time considerable numbers of poultry are kept in Wales, but these are, almost without exception, of a poor quality, and very little has been done in the direction of improvement during recent years. Perhaps this is explainable by the fact that the County Councils of the Principality have not given the same attention to technical instruction as in other parts of the country, their money being spent on intermediate education. It is necessary in order to influence a people that knowledge shall be taken to them at their homes, and until this is done progress must be slow. A further point is that the Welsh newspapers have not given the same attention to questions of this kind as has been the case both in England and Ireland. The importance of the subject is now being realized, and

steps are in progress for bringing Wales into line with England. As a rule, throughout Wales fowls are kept around the homestead and not distributed over the land, whilst very little is done to secure winter egg production and to finish off the fowls intended for killing in the manner which has been found necessary in England. Probably, of the three countries forming Great Britain, Wales is the most backward at the time of writing.

IRELAND.

Poultry-keeping has always been very widespread throughout the Green Isle, and at one time the bulk of the extraneous supplies received upon the British markets came from that country. This was prior to the dark period which marked the last two or three decades in the latter half of last century. But even during that period large quantities of eggs and fowls were produced. These, as a rule, were greatly depreciated in value, because both eggs and chickens were small in size, were carelessly packed, and practically nothing was done to insure their reaching the markets rapidly. As a consequence prices were low, and small encouragement was given to this industry. As a rule, in the middle and West of Ireland eggs have been, and are still, the main product. In the South and South-Eastern counties table poultry has always received a considerable amount of attention, and in the North both eggs and chickens have been bred to a large extent. As a rule, however, with the exception of Wexford and the adjacent counties, where table poultry has been given the first place, there was little specialization, and a great amount of loss was the result. Of recent years there has been a great awakening in this direction. The writer had the opportunity of taking a share in the work in 1888, when acting as Special Commissioner of the *Weekly Freeman*. Afterwards the Congested Districts Board, on its establishment, gave attention to poultry matters within the areas over which it had influence. Then came the establishment by Sir Horace Plunkett of the Irish Agricultural Organization Society, and later the formation of the Department of Agriculture and Commerce, under the Vice-Presidency of the same gentleman. Following the establishment of the department named, many of the County Councils have taken up the work of giving instruction in poultry-keeping, and although we cannot expect to see for some time full results of this movement, they are very manifest both in the amount of produce and in its quality. There has been a large increase in the number of fowls kept in Ireland, and many more will probably be maintained in the future. There is no part of the United Kingdom which should show more clearly the value of systematic instruction than Ireland, and with its climatic conditions and soil it produces some of the finest eggs and poultry which can be found anywhere. In respect to eggs, the great point is speed in marketing, but the proper fattening

or finishing off the birds has not yet received the full attention it requires. Ireland is a country of small farms, and consequently has special opportunities in the direction indicated.

FRANCE.

In France a different set of conditions have existed for a long period, and poultry-keeping is almost universal throughout the country. This was true even a hundred years ago, for in the records of his tours Arthur Young tells repeatedly of seeing immense quantities of poultry there. The Ministry of Agriculture has lent its powerful assistance and support to the development of the industry, and annual shows are held under its auspices, embracing poultry, both living and dead, as a prominent feature. It is calculated that the value of the eggs and poultry produced in France is a little over £16,000,000, nearly double the production of the United Kingdom. France not only supplies her own needs—which are great—but is enabled to export large quantities, although the supplies received in Britain are not so great as was at one time the case.

Personal observations in several parts of France have impressed one fact—namely, that poultry are made part of the regular work of all cultivation, even, where to our English ideas they would be least looked for, upon the vineyards which occupy so much of French land. The vine is subject to many enemies, and at one season of the year vineyards are infested by hordes of slugs and earth-worms, which if not kept down destroy the growth. It is customary in the month of June to employ labour to pick off those slugs, but the efforts of fowls are also largely depended upon to secure the same result, and at other seasons they are found to be most valuable helpers to successful working of the vineyards. Fowls are to be seen on every side and in every field. For them houses are provided, scattered here and there near to or among the vines. Some are permanent, but the majority are movable, and narrow enough to stand between the rows, generally provided with handles at each end to facilitate carrying. At all seasons the poultry are permitted to wander at will, save when the fruit is ripening, and we have seen a flock of thirty or forty birds eagerly following the plough, rejoicing in all the good things turned up thereby. They are famed for the quality of their flesh and the richness of their eggs.

The best soil for vine-growing consists chiefly of gravel, and in many places could not be used for anything else. There is a great variety in the quality of the soil for this purpose—in fact, as much variety as in the wines they produce. One very remarkable thing we learnt is that the best fowls are reared on the estates where the best wine is made. Evidently the combination of elements which go to make these wines are those needed to produce fine quality of flesh in

fowls. What these qualities are is not stated, but the fact is evident. Of course, the quality of the soil must have much to do with the flesh, for the richness of the Dorking country in England, and of the La Sarthe district in France, has been instrumental in making the fine fowls produced therein. For quality of meat we have not had any that were superior to these French fowls. Further east in France are found the famous La Bresse poultry, which command the highest prices on the Paris markets. These birds come from the Departments of Ain and Saône-et-Loire, to the south of Burgundy, where we find very similar conditions prevailing to those met with in the Medoc, and in Normandy magnificent birds are produced on the rich plains and valleys of that great province of France.

At Bordeaux is an arrangement which we have seen in some other parts of France, and also in Austria—namely, the sale of fowls in sections. At Paris half-fowls can be purchased, but at Bordeaux the system is carried out much further. Here almost any portion can be purchased separately—breast, legs, wings, or carcass. This method is applied to all kinds of fowl, and we saw chickens, turkeys, ducks, and geese so treated. The blood is also sold separately, and no portion of the fowl is wasted. The same plan is adopted in Normandy, more especially with regard to turkeys and geese.

Whilst almost every part of France produces considerable quantities of eggs and poultry, the departments which chiefly supply our English markets are the northern, north-western, and western, or those bordered by the English Channel and the Bay of Biscay. Over the whole of this large area poultry-keeping is an important part of rural operations. Every farmer and cottager maintains a considerable flock of poultry, and some depend chiefly upon them for their livelihood. But there are no large poultry farms to be found in these or any other districts of France. The system adopted is that collectors visit twice or thrice a week, and sometimes daily, each farm or cottage, taking the eggs obtained to dealers, who pack and forward to England. So perfect is this system in the north-eastern departments that it is possible for eggs to be offered for sale in London the fourth day after they are laid. Without such a system of collection French eggs would never hold the position they now occupy, for it prevents the eggs being marketed when they are stale. Having had the opportunity of visiting nearly all the poultry districts of France, we must pay a tribute to the remarkable skill in breeding, general management, and feeding, as shown by the French farmers. It is also desirable here to make record that in all the races of poultry kept in that country the economic qualities are always regarded as of primary importance. At the same time, we must frankly state that French poultry-keeping has not made any great progress of late years.

BELGIUM.

In Belgium, which, it must be remembered, is a country of small farms, poultry hold a relatively important position in regard to agriculture, and are an instance of that intensity of work which characterizes the Belgians. In addition to the Concou de Malines, which form the pre-eminent fowl of Belgium, there is a large demand for small chickens, which are called *poulets de lait*, and of rather larger birds called *poulets des grains*. The former are the same as the *petits poussins* of France, and the latter something like the *broiler* of America, both of which are referred to in the chapter dealing with table poultry. Ducks are also bred to a considerable extent in the district lying between Brussels and the sea. These birds are smaller than we are accustomed to see in this country, but they are very fine indeed in quality. During the last few years there has been a great development of poultry-keeping in Belgium, both for eggs and table poultry. This is seen especially in Flanders and Brabant, to which districts the author recently paid a visit. To the north of Malines vast quantities of Coucou de Malines are bred on the sandy soil and amongst the pine-woods there met with, and it is acknowledged that the great increase of fertility in the soil is largely due to the fowls kept thereon. When the chickens have attained a sufficient age, they are taken to a market at Londerzeel, where come the fatters from Merchtem, Opwyck, etc., who take them for feeding off in much the same manner as our Sussex men. The extent of the business is shown when we state that at Merchtem half a million fowls have been sold in the public market in twelve months.

In other districts eggs are produced to a very large extent. The two varieties chiefly kept for this purpose are the Campine and the Braekel. The former is a relative of our Pencilled Hamburg, and is admitted to be one of the best layers known. At one time its eggs were very small, not much more than $1\frac{1}{2}$ ounces in weight. By careful selection they have been considerably increased, and now the average is over 2 ounces each.

A new industry has sprung up in Belgium within the last ten years. Some hundreds of thousands of pullets are imported annually from Italy, which are sold to the farmers at about 1s. 6d. each. They are of the Leghorn type, and prove to be excellent layers. As a rule they are imported during the summer months, when from three to five months old. One importer whom we interviewed receives about 200,000 of these birds every year, and there are others engaged in the business. The buyers only keep them for one year, when they are fatted off and killed, a fresh lot taking their place. There is no reason why some such system could not be adopted in this country, but it would be better if breeders in Ireland or the less cultivated dis-

tricts of Britain provided the young stock, as they could do if they laid themselves out for breeding on an extensive scale.

A very interesting point was brought out in connection with Belgian poultry-keeping by Monsieur L. Vander Snickt, of Brussels, in a discussion which took place at the National Poultry Conference held at Reading in 1899. This was the influence of the cock-crowing contests in Belgium as indicative of the economic qualities. M. Vander Snickt showed that the cocks which crow longest are usually of the families that are the best layers, and those cockerels which crow earliest are most suitable for use as "milk chickens." In fact, this sport in Belgium is to a large extent utilized for its practical value.

GERMANY.

In the German Empire the production of eggs and poultry, with one or two exceptions, is upon a comparatively limited scale—in fact, Germany does not produce nearly enough for her own needs, and imports large quantities of eggs from Russia and also from Italy. The exceptions in Germany are that throughout the southern part of the Empire geese are bred to a very considerable extent, and these are of excellent quality, though smaller in size than we are accustomed to see in this country. In Eastern Prussia and Hanover geese are bred largely, and many of these are sold to English feeders for the purpose of feeding off. As a rule, British methods are followed in Germany, but farmers and others have not given nearly the attention to this industry which is met with in the United Kingdom.

DENMARK.

One of the most remarkable instances of what is possible of accomplishment by determined effort is the development of the Danish egg trade. A little more than twenty years ago egg production was practically non-existent. In 1880 the exports of eggs were only in value about £80,000, whereas in 1903 Great Britain received eggs from Denmark in value £1,648,367. This remarkable result has been the outcome of definite effort. About twenty years ago an inquiry was held as to the possibilities of increasing the number of poultry throughout the country, and also as to the class of fowl which would be most suited to the production of eggs for the British markets. As a result the Leghorn—or, as it is called upon the Continent, the Italian—fowl was adopted and distributed throughout the country, at first in small numbers, but increasing as time went on. As a rule, the Danish farms are small, and the number of birds kept upon each holding is by no means great; but when everyone took up this industry with the determination to make the most possible out of it, even in a small country an enormous amount of eggs can be produced. It is

not too much to say that the great success of the Danish egg trade has been due to the co-operative poultry societies which have been formed in that country. These societies do not interfere with the production, but combine the members for marketing, and as a consequence they have introduced what is a most perfect system of grading and packing for carriage over long distances, and of marketing in the shortest space of time. It is unnecessary for us to attempt to give any description of these various societies, because similar organizations have been formed in both Great Britain and Ireland. It may be remarked that the total number of fowls kept in Denmark in 1893 was 5,855,999, and five years afterwards that number had increased by nearly 3,000,000, and at the present time it is estimated that there are about 10,000,000 fowls in the country, or an increase of nearly 100 per cent. in ten years. Considering the conditions, there is no country where development has made such progress as in Denmark. We are inclined, however, to think that the chief advance, apart from the increased number, has been in the methods of marketing rather than in production. Up to the present time poultry has not held any prominent place in the poultry economy of Denmark; in fact, without the introduction of other breeds than those which are generally kept, it would be impossible to send out chickens that would compete upon our markets, and it is a question for consideration whether this would be profitable, because the displacement of egg-producing breeds by those of great flesh qualities would tend to reduce the number of eggs obtained. The Danes, however, have shown in the past such remarkable powers of development and organization that it is impossible to forecast what they will do in the future.

ITALY.

Considering that Italy was one of the pioneer countries in the development of poultry-keeping for the supply of food, the present conditions, both in respect to breeds and management, are distinctly lacking in method. Italy is to a large extent a country of small farms, and, so far as our observation goes, the greatest amount of progress has been made in Northern Italy, and it is from the provinces of Lombardy, Piedmont, Venezia, and Ancona that the large supplies of eggs received are derived; whilst from Emilia we obtain, as a rule, considerable quantities of turkeys at the Christmas season. In Northern Italy cultivation is carried out on advanced lines in many directions, but the value of poultry as part of the stock of the farm in relation to cultivation has not yet been understood, and hence it is that in travelling throughout the country very few fowls are to be seen. In no sense is the industry specialized in Italy, with the exception, perhaps, of turkeys to a limited extent in Emilia. The classes of fowls chiefly kept are those most suited

to egg production, which branch is receiving an increasing amount of attention. It must be remembered that two of our most valuable egg-producing races—namely, the Leghorn and the Ancona—originated in the Peninsula. In certain parts of Italy, more especially within the influence of the Alps and of the Apennines, the conditions are favourable to poultry-keeping; but in Mid and Southern Italy we do not anticipate that the same results can be obtained. At the present time there is a movement going on for the extension of co-operation in that country, which promises to yield considerable results in the future. Hitherto it has been chiefly confined to purchasing supplies for farmers, and the disposal of produce has scarcely entered into the scheme.

AUSTRO-HUNGARY.

Our observations with regard to South Germany are largely applicable to Austria, where the class of poultry production which has yielded the best results is that of geese, very fine specimens of which are met with in Vienna and other markets in the autumn of the year. The table poultry in Austria, with the exception of geese, are very moderate in quality, although there are signs of improvement in this direction. The fowls kept are not of a class to yield the best specimens, being more suitable for egg production. Nor can it be claimed that eggs are of fine quality; in fact, as a rule they are small in size and almost universally white in colour. We were told in Austria that all the large eggs were sent to England, but this is probably not altogether correct, and the size of the eggs in Austria is distinctly small.

Within the last few years there has been a considerable development of poultry-keeping in Hungary, one evidence of which is the largely increasing quantity of eggs received by Great Britain from that country. Throughout South Europe the type of fowl which is generally met with upon farms is of the lighter-bodied varieties, similar in conformation to the Leghorn or the Italian fowl, and this is true from Spain to the Balkan provinces. These are chiefly kept for egg production, and they make very poor table poultry. Within the last few years, however, a great change has taken place in respect to the class of poultry kept in Hungary. Many experiments have been made as to the class of fowls to be adopted, and it is satisfactory to note that the Hungarian agricultural authorities recommend the Buff Orpington as being the most suited to the requirements of the country, improving at once the size and meat qualities of the birds, and also the colour of the eggs. We may anticipate, therefore, that within a few years the character of the fowls in Hungary will be entirely changed. In some parts of the country great quantities of geese are met with, especially in the neighbourhood of the Danube. In many of the Hungarian villages there is

a considerable amount of common land, and, as was the case in England in former times, geese can thus be kept to a much greater extent than where such opportunities are denied. Not much is done in the way of ducks, but a great many turkeys are bred. These are chiefly white in plumage—that is, of the South European type; in fact, all white-plumaged fowls are preferred by reason of the greater value of their feathers. It must be borne in mind that Hungary is a country of small farms, and that peasant proprietorship has greatly extended there. This in itself would not explain the remarkable advance made in recent years, for individual owners are very apt to fall behind in the race unless they are stimulated by competition or combination with their neighbours. At the present time a great movement is going on in Hungary in the direction of co-operation, and it is fully recognised that poultry-keeping is one of the branches of agriculture which is most suited to the conditions of the country and to its soil. We believe that Hungary is probably the country which will make most marked progress in the future. A recent report made by an official of the Hungarian Poultry Society says that ere long Hungary will export more poultry than grain, that the fowl industry pays ten times as much as any other branch of agriculture, and that thousands are making money by the export of eggs and fowls.

RUSSIA.

On reference to the tables of imports,* it will be seen that the country which sends the greatest amount of poultry supplies to Britain is the Empire of the Czar, but the Trade and Navigation Returns do not tell the whole story, as large quantities of the supplies credited to Germany come from Southern Russia, and the total amount paid to that country for eggs and poultry amounts now to upwards of £3,000,000 per annum. Yet as a whole Russia is one of the most backward countries in respect to poultry-keeping, and these enormous supplies are due to its wide extent and to the enterprise of egg and poultry merchants, many of whom are Englishmen settled in that country. The fowls are poor as a rule, although efforts have been put forward for improvement. The districts where poultry are chiefly bred are in the fertile country to the south and south-east of Moscow, where the soil is very much richer than in Northern Russia. Whilst a few of the larger proprietors have made attempts to improve their poultry, the majority of those who contribute to the enormous quantities of eggs and chickens exported are the peasants, who as a rule do not keep more than six to ten fowls, a larger number than that being very rare except in the case of innkeepers, who have greater opportunities and frequently own a much greater stock. The peasants do not give any attention

* Appendix B.

to their fowls, breeding them in a very haphazard fashion, and the birds have to find nearly the whole of their living, which chiefly consists of vegetable growth and grain that may be accidentally spilt, with such waste food as can be found upon the farms or falls from the provender given to the cattle. At night they usually sleep in any place they like, and it is a very rare thing indeed to meet with a special poultry-house. It is only under conditions like this that eggs can be produced to sell at such low prices as Russian realize in England. As showing how far this is carried out, during our visit to Russia we were told by one of the largest merchants there that after the first week or two chickens are not fed at all, and that it is a rare thing for the older birds to be supplied with any food. The Russian Government has given a great deal of attention to the advancement of poultry-keeping, but it is hampered by the poverty and ignorance of large masses of the population.

OTHER EUROPEAN COUNTRIES.

A few words will summarize such knowledge as we have with regard to other countries. Spain and Portugal produce very little in the way of poultry and eggs, and during our visit to the former country we never saw a decent fowl, either in the shops or upon the tables of the hotels. Eggs are small in size, even though attention has chiefly been given to egg production. The Balkan States send in the autumn of the year considerable quantities of eggs and poultry to this country, but they are very cheap and poor in quality. Our information with regard to those countries is very scanty, but we believe that they have opportunities for development of which advantage may some day be taken. A fair quantity of eggs are received from Turkey, but here again the conditions of the country do not tend to the development of industries of this nature.

BRITISH COLONIES.

The colony which has given the greatest amount of attention to the development of poultry-keeping is Canada, and during the last decade production has increased to a very large extent. In a country like Canada, however, with so vast an area of land and a scattered population, surplus products cannot be marketed with the same speed as under a different set of conditions. Hence, whilst attention has been given to a fair extent to egg production, special thought has been taken in respect to table poultry, and large quantities of chickens, geese, and turkeys are placed upon our markets at certain seasons of the year. In so far as eggs are concerned, everything has been done that is possible to obviate the difficulty arising from distance, because, since the passing of the McKinley Tariff Act by the United States Legislature, the tax placed upon Canadian eggs has been practically pro-

hibitive, and the only market available was the United Kingdom. Still, in spite of everything than can be done, distance cannot be entirely overcome. Care in collection, good packing, and refrigerated chambers will do much to this end, but they cannot entirely accomplish it, and it is for that reason that Canadian eggs, which are chiefly marketed in the autumn and winter, do not command very good prices. The direction in which improvement has been most manifest is table poultry, but here the system which is prevalent throughout North America of feeding almost entirely upon maize militates against the value of the birds when received. We are glad to see, however, that the requirements of the English market are more studied, and that efforts are now being put forth to finish off the birds in accordance with the most advanced methods. What the future may have in store we cannot tell, but it is desirable to recognise the efforts put forward by the Canadian Government to disseminate information in this direction, and probably in a few years poultry-keeping will occupy a much more important position in Canada than is generally anticipated. Our colonies have great advantages in one direction—namely, that land is cheap, and thus fowls can be distributed to a much greater extent than is possible in an old country.

During the last few years considerable efforts have been put forward by the governments of our colonies at the Antipodes for the development of poultry-keeping, and producers have responded very well indeed to these efforts. In a new country where land is abundant methods which are essential in Europe would be out of place, by reason of the fact that the fowls can be distributed much more freely than is the case here. Attempts have been made from time to time in Australia for the setting up of extensive establishments, but as a rule these have been more for the breeding of exhibition or stock birds than for the production of eggs and chickens for market. In Australia and New Zealand shipments sent to this country are very carefully selected, and are packed well, which gives them a distinct advantage. It is impossible to forecast what the future has in store with regard to our Australian colonies, but we are disposed to think that Australia, at any rate, has many difficulties to overcome, by reason of distance, to meet the demands of our European markets. So far as methods of management are concerned, we believe that these are largely upon British lines, modified in accordance with local conditions.

At the present time much is being done for the development of poultry-keeping in South Africa, but it is not at all probable that that country will provide for its own needs in eggs and poultry for some years to come. The opportunities are great, but the difficulties are many, and certain forms of disease counteract the efforts of poultry-keepers—diseases which are practically

unknown in Europe, at any rate of the type which is met with in these colonies. At the present moment efforts are principally in the direction of increased egg production, and we are informed by experts that lighter-bodied fowls are most suited to the climate and conditions.

UNITED STATES OF AMERICA.

Poultry-keeping has for a long period of time received very considerable attention in the United States. The editor of the *Bureau of Animal Industries* estimates that in 1899 the total value of the poultry and eggs produced was \$281,178,247, nearly equal to the cotton crop of that country. Some time ago it was stated that the domestic hen had saved the State of Kansas, by which was meant that the farmers of the State named had been enabled to keep their heads above water by adding poultry-keeping to their other operations. We know that vast quantities of fowls are killed in the great slaughter-houses of Chicago and St. Louis, many of which are sent to the Eastern markets, and that hundreds of millions of eggs are kept in cold stores for the winter supply. So that the industry is carried out upon a large scale. It would be impossible here to go into full details with regard to poultry-keeping in America, of which we have heard a great deal of late years, but it is noteworthy that in the United States some of the largest poultry plants found in any part of the world are met with, and there can be no question that we owe to American enterprise and perseverance a great extension of our knowledge as to the principles of keeping poultry upon a large scale. It was in that country the value of the scratching-shed system for practical purposes was first recognised, and also that duck-raising could be profitably carried out upon very intensive lines. A further direction in which America has undoubtedly led the way is in experimental work. In nearly every one of the more advanced States there exist experimental stations, in some cases conducted on very elaborate lines. At these places experimental work is carried out, and the results scattered broadcast amongst farmers and poultry-keepers. All branches of poultry-keeping are found in the States, and the consumption of chickens, ducks, geese, and turkeys is enormous. In spite of the very adverse climatic conditions during the winter, it has been proved that egg production at that season of the year is possible and profitable, although the prices obtained are no greater than we are accustomed to secure in this country.

To summarize the results of later investigations with regard to American aviculture, it may be stated that in large establishments carried out upon intensive lines it is distinctly in advance of any other country, but that general poultry-keeping upon farms is at a much lower grade than met with in Great Britain. In this country we have distributed the production as widely as possible, whereas in America concentration seems to have been the main object. America is to a large extent self-contained, and does not produce much more than her own requirements, and probably in the future she may need to import extraneous supplies. Of recent years a change has been noted in the ideas with regard to table poultry. The extensive use of maize for feeding, as also in Canada, has resulted in the fact that nearly all the birds are yellow in flesh, and there has been the opinion that yellow-fleshed and yellow-legged birds were the finest for table purposes, which is entirely antagonistic to European views. That, however, seems to be changing, and probably with the introduction of the fattening system into the States, and the greater use of milk, the future may see very marked changes in this respect.

SUMMARY.

It is noticeable that in no country where poultry-keeping is carried out at all extensively is production the result of large farms, with the solitary exception, to some extent, of the United States. In all other directions the enormous amount of produce is owing to the efforts of a multitude of poultry-keepers, each contributing his quota to the general sum, and it is in this direction we hope for further developments in the future, as that will mean the greater good of the greater number. Those countries which have succeeded best have not been where races of fowls and methods of management have improved alone, but also where organization of the trade has secured for producers the highest possible returns, and it is necessary that one shall be a corollary of the other. Special farms for the production of breeding stock are essential and should be encouraged, whilst chicken and duck fattening are desirable in order to finish off the work of the farmers themselves. We believe also that they are most economical at this stage of the operations. What we have to aim for, therefore, is that production shall be stimulated by ensuring, through organization of the trade, adequate returns to producers.

CHAPTER III.

MODERN DEVELOPMENTS.

EFFECTS OF GREATER COMFORT AND TRAVEL—BETTER PRICES OBTAINABLE—FARMERS COMPELLED TO LOOK IN
NEW DIRECTIONS—ROYAL AGRICULTURAL SOCIETY—DIRECTIONS FOR IMPROVEMENT—INFLUENCE OF SHOWS—
FATTENING INDUSTRY—DUCK-BREEDING—INCREASE OF POULTRY UPON FARMS—POULTRY AND FARM CROPS—
RAILWAY RATES—RUNNING FOWLS ON FARMERS' LAND.



HERE can be no question but that in the last few years there has been a large increase in the consumption of poultry produce. The greater comfort in which many of our vast industrial army now live than was the case with their grandfathers, and the enormous increase in wealth of the middle class, has resulted in a demand for finer and more delicate articles of food. Further, travelling in other countries has broadened the ideas and cultivated the tastes of our people, for when they have experienced the delicacy of French cookery, and learnt the multifarious ways in which both fowls and eggs can be served, they seek to follow on similar lines. And there is every reason to assume that this line of progression will continue, and that poultry produce will more and more enter into the food-supply of the country. At one time it was generally conceded that French table poultry were greatly superior to our own; but that is no longer the case, due to the great advance made in this country during the last decade, which is recognised as greater than in any previous period. So far as eggs are concerned, it is chiefly a question of quantity and methods of marketing, for France cannot send us any better eggs, and perhaps not as good as are to be obtained in Great Britain or Ireland. Some day it may be that eggs will be sold for quality and by name of breed, for there is no reason why the quality should not be paid for as well as the quantity. We need fear no one with regard to the quality of our turkeys, geese, and ducks, as they are the finest produced in Europe. Well-fed fowls can be obtained upon the London markets, chiefly from Surrey and Sussex, but by no means is production confined to those counties as was at one time the case, and the improvement which has been made of late years is remarkable, in spite of the fact that much higher prices can be obtained for high-class poultry on the Paris and other French markets than in Britain.

Still, when we remember the rates asked for spring ducklings, for Christmas geese and turkeys, it is very evident that there are plenty of people ready to pay top prices for first-class fowls if they are to be had. This has been the experience in all other branches of food, and would undoubtedly be so with poultry.

FARMS AND POULTRY.

The force of recent events in connection with agriculture, and the necessity for paying more attention to other branches of this great industry than was the case a few years ago, is doing much to compel farmers to look to fresh developments. Many, who would have spurned the idea of poultry-breeding as an important part of their regular operations, are now looking to it with a friendlier eye. Careful observations throughout the country have led us to the opinion that more fowls are kept than ever was the case before. Much of this is due to the fact that in 1885 the Royal Agricultural Society determined to add a poultry section to its annual shows, and since that time it has been a most interesting feature of the great society's annual exhibition. This is now upon an excellent basis, providing classes for all the most useful breeds as well as various crosses, and by means of dead poultry classes giving a practical object-lesson which cannot fail to be of great benefit to those who see the specimens displayed. At the London Smithfield, Birmingham, and Dairy Shows table-poultry classes have been given of late years, and more has been learnt in connection with these displays as to the relative value of poultry upon the table than would have been possible in any other way. We can bear emphatic testimony to the fact that since the Royal Agricultural Society lent the support of its influence to the encouragement of poultry culture, prejudice has been easier to combat, and farmers generally have looked with more favour upon this as a branch of their operations. And in many parts of the country examples

can be met with of those who have gone in for it with decided success. But there is much yet undone. The influence of a few successes will go far to break down prejudice remaining, and when it is seen that farmers can add to their success by taking up poultry-keeping with energy and skill, the more conservative of their neighbours will ere long be compelled to recognise its importance. Dissemination of the best information as to breeds and methods of management, and better ways of bringing producers and consumers into closer touch, materially help to this end. We are pleased also to acknowledge greater readiness on the part of chambers of agriculture and of farmers' clubs to allow this subject to be discussed, and we have welcomed the opportunity afforded us from time to time of attending such gatherings and delivering addresses thereat. In a few instances dairy and agricultural schools have established a regular series of lectures on poultry-keeping, and much more might be done in this direction with manifest advantage. The training of young agricultural students will have a vast influence in the future, and we hope that ere long every such school will make poultry-keeping a part of its regular course. There is yet another way in which influence can be brought to bear, namely, by landowners and men of leading position in the country. Thus in various ways has the matter been brought forward, the all-powerful press from time to time lending the weight of its influence. Consequently, it is not at all surprising that poultry-keeping occupies an altogether different place from that held by it a few years ago. And as the various County Councils are now engaged in teaching poultry-keeping for profit, it is not unreasonable to expect that we shall see a very marked change in a few years. It is all-important, therefore, that this subject be kept to the fore, and that farmers and cottagers should recognise the possibility of making it a profitable source of income. To do this right methods must be adopted, and the present work has been written with that object in view.

DIRECTIONS FOR IMPROVEMENT.

The directions in which improvement must take place are: (1) better breeds; (2) more correct methods of management; and (3) improved systems of marketing, each of which are essential to success, and the neglect of which must greatly minimize any profit derived from the pursuit. The question of breeds is of primary importance, for there is a great difference in the respective breeds of poultry as to their economic qualities, and these must be studied in order that selection may be made of those most suitable to the place and the object in view. Fortunately, there is an abundant variety from which choice can be made, so that every condition and need can be provided for. What we recommend is that a breed which at once supplies the requirements of any district, and is found

to adapt itself to its special condition, should be adopted. This has been done in Devon and Cornwall, where poultry-keeping is universal, but the methods of management leaves much to be desired, and has not advanced to the same extent as elsewhere. In the first-named counties are to be found the Minorca and Indian Game, the former one of our best laying varieties, and the latter excelling greatly in its table properties. It is in the way here recommended that our country has become famous for its cattle and horses and other kinds of stock. Divided and erratic methods will never succeed, and we believe that when fowls of a common type are found universally in any district—provided, of course, that they be of the best kind for that district—the results will be much more satisfactory than when selection is made upon a higgledy-piggledy fashion, which is only too common. We have had the pleasure of meeting several agriculturists who breed poultry extensively, and the plan adopted by them has been to test different varieties upon a small scale, and then adopt the breed which proved to be most suited to their place and conditions. It is often found desirable to keep two varieties, in order to provide for both a winter and summer supply of eggs, and still more so when chickens are to be marketed; and as one of the matters which every poultry-keeper must bear in mind is the maintenance of a regular supply of eggs, it is not surprising to find that the winter laying breeds are becoming more and more popular.

At one period, mongrels, or "barndoor" fowls as they were misnamed, were almost universal all over the country; but it is being more and more realized that all improvement must be by means of pure races, as has been the case with larger stock. Farmers now are understanding the importance of always introducing pure-bred male birds among their flocks, and never using cross-breeds for this purpose. But a mistake is made by year after year changing the breed of male bird. Sometimes one and sometimes another is used, and frequently they are antagonistic in nature, so that the improvement is not nearly so rapid or so steady as would otherwise be the case. It is much better to learn which breed or cross is most suitable to the soil, the general conditions, and the market demands, and adhere to it, of course securing fresh blood for mating each year. Indiscriminate crossing is a mistake.

THE FATTENING INDUSTRY.

Until a comparatively recent period very little was known as to the great fattening industry of Sussex, Surrey, and West Kent, which practically has had the monopoly of producing the finest qualities of poultry. Over a very wide area rearing of chickens for selling to the higglers is carried out, and so great is the demand for these birds that something like 300,000 are brought over from Ireland every year to supply the places which cannot be supplied locally. Moreover, fatteners

complain that they have to pay such high prices for lean birds that they do not make the profit they should secure. One farmer in West Kent sold chickens to the value of £87 to the higglers in twelve months, the produce of fifty hens, which works out at nearly 35s. per hen. All this shows a very healthy state of things. As a further indication of the extent of the industry, in twelve months the London, Brighton, and South Coast Railway Company conveyed from two stations in Sussex, Heathfield and Uckfield, 1,850 tons of dead poultry, and consignments are made from many other stations. That breeders and fatters alike find the business profitable cannot be doubted, and the same principles adopted in other districts would give like results.

Consequent upon the movement in favour of developing table poultry elsewhere than in the counties named, for there is no reason why it should be concentrated on the Weald Clay, it is satisfactory to record that fattening establishments have been commenced in many other parts of the country. From personal knowledge, these are now to be met with in Middlesex, Essex, Hampshire, Cornwall, Gloucestershire, Shropshire, Norfolk, Cambridgeshire, Lincolnshire, Yorkshire, and Lancashire, in South Wales, and the south-west of Scotland. The chief difficulty experienced by the owners is in obtaining a supply of suitable birds, but in process of time it will be overcome, so soon as breeders learn the advantage of meeting the requirements of fatters. There is no reason why fattening should not be carried out in one place as in another. Many districts, especially where lighter soils are met with, would give equally good results in securing early birds. The heavy lands would not be quite so good for this purpose, but there the system prevailing in Belgium could be adopted, namely, of rearing in one district and fattening in another, markets at suitable centres bringing the two classes into contact. In Ireland, than which there is no more suitable country for poultry-rearing, an effort is now being put forth in this direction, and it may become as famous for its fat poultry as for its butter. It certainly appears better to send the birds fat and dead, rather than sell lean and allow them to be fatted in Sussex.

DUCK-BREEDING.

Another direction in which there has been considerable development since this work was first issued is that of duck-breeding. At one time it was concentrated in the industrial form in the Vale of Aylesbury, in Buckinghamshire; but it has greatly extended, and now vast quantities are produced in Bedfordshire, around Leighton Buzzard. There is no need, however, why those two counties, good though they are for the purpose, should have a monopoly, and it is pleasing to record that equal success has been achieved in other parts of the country. In the Fylde district of North

Lancashire the number of ducks kept is enormously in advance of ten years ago. This is largely due to the example of Mr. Peter Walsh, of Fleetwood, who in 1903 hatched and reared and marketed nearly 35,000 ducklings. Mr. Walsh is a farmer, the inventor of an incubator, with which he hatches the bulk of his birds, and what he has done there can be accomplished elsewhere. That he has found it profitable is unquestionable, and as we tell in Chapter XVI. the story of his enterprise, it will astonish many of those who have thought that 'poultry don't pay.' Another farmer in Norfolk, near Diss, raises annually about 10,000, and many other cases could be cited where excellent results have been secured, though perhaps not on so large a scale. In Cornwall a commencement has been made in the same line, and if the residents of that county take it up with the same determination as they have shown in other branches, they will be able to place very early ducklings on the London market.

INCREASE OF POULTRY UPON FARMS.

It is only necessary to exercise a small amount of observation to see that in connection with ordinary farming there has been a very great increase in the number of fowls kept throughout the country. Even from the windows of railway carriages this is apparent to the traveller, but when we take the rural districts in detail, it is very gratifying to see to what an extent development has taken place. As a rule, the increased number of fowls is accommodated in the portable houses or 'huts,' such as are described in Chapter VII and there can be no better method of linking poultry culture with ordinary farm operations. We believe that the increase of poultry now kept in some districts is much greater than is commonly supposed, but hundreds of thousands more could be maintained without any difficulty whatever, in so far as opportunity is concerned.

POULTRY AND FARM CROPS.

This is even true in arable counties. Abroad it is not found that fowls do any serious injury to growing crops, such as corn, roots, etc., but with us the opposite notion is very strongly held. Even the small amount of damage is far more than compensated by the benefit received, both in the shape of manure and keeping down various pests. A striking proof of this was published in the *Agricultural Gazette* (April 26, 1897), which is in itself an indication of dying prejudice against poultry. Mr. J. R. Woodhouse wrote as follows: 'Last spring I planted a field of barley, and it so happened that I did not go near it again for some nine or ten days. Now, when I did visit the field, I found that my fowls had been there, and had played such havoc, as I thought, with a portion of the field, that I concluded it would have to be replanted. I, however, was not in a position to do so at once, and before I could make it convenient the barley was up.'

I then found that this portion of the field was certainly not so thick as the rest. Still, I thought if it should rid, or stool, as it is sometimes expressed, it would do, and therefore I did not interfere with it. I did so, and I harvested a very fair crop. About a fortnight after it came up there appeared unmistakable signs of wireworm in various parts of the field, but no indication whatever of there being any in that portion of the field where the fowls had been at work. I therefore did nothing to this, but applied a dressing of nitrate of soda to the rest of the field, that being the best remedy I ever could discover for this pest. It had the desired effect; but, taking it as a whole, the portion of the field thus dressed was no better than that where the fowls had been, which was not so treated. I was mentioning the circumstance to an acquaintance of mine, and he said his uncle some thirty years ago went over Tiptree Hall, and, afterwards meeting the late Mr. Machi, had some conversation with him, and expressed surprise at his allowing the poultry to run over the fresh-planted fields. His reply was "that if the grain was put in sufficiently deep he considered they did more good than harm, as they picked up a number of insects that were injurious to the crop." This theory, which I have no doubt would have been laughed at by many farmers, and which at one time I should have treated with ridicule myself, this year proved correct in my case.'

RAILWAY RATES.

Complaints have been made frequently as to the hindrances placed in the way of producers by high railway rates, especially for small parcels. This question is one which appeals to nearly every producer. That there has been, and still is, some measure of truth in the statements appears to be unquestionable. Certain of our great railway companies have made what appears to be a reasonable attempt to meet the changed conditions by offering specially low rates for small parcels. Upon the general question it is not for us to enter, but in the Appendix* we give particulars as to the rates offered by several of the leading railway companies, and which apply more or less to the majority of these great corporations. In this connection it must be remembered that the forwarding of eggs—at any rate, to market—cannot be regarded in the same light as is the sending of supplies from abroad. If we are to hold our position upon the markets, the eggs must be forwarded whilst they are fresh, and not wait until a sufficient quantity is gathered to fill up a large case, much less a truck. We must, therefore, always expect to pay a higher rate for this privilege than if they were forwarded in greater quantities. Several of the railway companies have what is called an express goods service, which is much cheaper than by passenger train, whilst the delivery is in the majority of instances

almost, if not quite, as quick. There are many points about the rates question yet to be considered and put right, and further attention is given to it in the chapter on Marketing. We believe that there is a strong disposition on the part of railway companies to respond where there is a probability of regular traffic, but intermittent and uncertain production can scarcely be expected to obtain the same rate as where a constant supply is available. The Great Eastern Railway Company carry 20 pounds weight of agricultural produce from any part of their line for 4d. There has also been a lowering of charges in the parcels post, but, for reasons which will afterwards be given, attention is required specially to what may be termed "the smaller parcels traffic" between producers and retailers.

RUNNING POULTRY ON FARMS.

In the industrial districts during the last few years a system has been coming gradually, but very steadily, into vogue, more especially in what may be termed the manufacturing villages of the North of England. This system undoubtedly increases the opportunities of poultry-keeping to a large extent, and for that reason well worthy of support. Arrangements are made between the poultry-keepers—who are usually operatives—and farmers, for the former to place poultry-houses out upon the farmers' fields, and to maintain an agreed number of fowls thereon. The advantages of this system will be apparent in that, not only does the farmer receive rental for the land over which the fowls are permitted to run, but also he assures for his land in a very cheap way a considerable quantity of manure, thus improving the value of his crops; whilst, on the other hand, the poultry-keeper, who is usually landless or has only a very small plot, is enabled by the system here described to keep a very much larger stock of fowls at less risk than if he were obliged to take the land entirely for himself. Of course, the method is more suitable for grazing counties than where arable lands prevail. But there is no reason why, especially in these days of so much land laid down to grass, in every grazing district the plan might not be followed, and it would probably have wide-reaching influences if properly carried out, in that, apart from the immediate benefit derived, it might give opportunities to cottagers for keeping poultry and improving their position.

To carry out this system arrangements should be clearly defined. The poultry-keeper must move his houses about in accordance with the wishes of the farmer, which is reasonable, for if a house were allowed to stand too long in one place the herbage around would be injured or destroyed. On the other hand, the farmer must give access to his fields, which occasionally involves trouble; but with mutual desire to meet each other these difficulties can be overcome, and it is found, from the fact that the system is in-

* Appendix C.

creasing greatly, that its advantages are very marked. For such a plan the preferable method is to utilize movable poultry-houses, though that is not always carried out. We have seen a place where a corner of the fields is allowed for the house, and with a little fencing or barbed wire around, in order to keep off the cattle, the house is never moved from one end of the year to another. Under these circumstances that part of the field was practically waste to the farmer. Hence, probably, the poultry-keeper would have to pay a slightly increased rent where he was allowed to put down a permanent house, from the fact that the labour of moving the house about was obviated. At the same time there is no question that the portable house system is better for the farmer, in that the manure is more evenly distributed over his land, and the grass is eaten everywhere instead of in one place. So far as the poultry-keeper is concerned, this system is preferable, in that there is much less danger of taint in the soil. Further, the fowls themselves can obtain a much greater amount of natural food than if practically restricted to one corner of the field. In some cases where the fields adjoin the residence of the poultry-keeper, the arrangement is frequently made for the fowls to run over the fields for the greater part of the year, a small rent being paid, and under these conditions all difficulty as to moving the house is entirely obviated.

It is well in this connection, both for the sake of the farmer and of the poultry-keeper, to consider the number of birds that can be kept per acre under such conditions. Where the land is kept altogether for the poultry, then more can be maintained than if other stock are allowed; also there is a great deal of difference in the nature of the land. In some districts,

especially upon the richer soils and in sheltered positions, a much greater number can be kept than on the higher lands where the soil is thin and the grass poor. Supposing that a farmer has other stock upon his land, they require the greater part of the grass, and if he were to allow too great a number of fowls it would be to the injury of his own stock. Further, although we have very little evidence at all helpful in this direction, it is probable that, if too many fowls were kept with other stock, the ground would more readily become tainted. We are inclined to think that, taking one part of the country with another, farmers who keep stock of their own would be wise to limit the number of fowls kept per acre to ten, or at most twelve—that is, when they are not kept by themselves. If the farmer is a poultry-keeper himself, then, of course, he may keep a greater number in accordance with the quantity of his larger stock. We should take it as quite reasonable that a farmer giving access in the way we have indicated should limit the number of fowls to be kept in each house, and not to permit more than ten or twelve at most per acre; in fact, in many cases it would be much better to only allow half the latter number. This will have to be taken into account in the rental which is charged to the poultry-keeper. In some instances a charge of 6d. per bird per annum is a common rent, although we have heard of more than one case in which less was paid, the farmer allowing the fowls to run over his fields at a charge of 10s. a flock of twenty-five, realizing that the manure obtained is a very important factor. The system is one that is capable of very great extension, and has so many advantages, both from a personal and a national point of view, that as far as possible we are anxious to encourage it in every way.

CHAPTER IV.

THE BREEDS OF POULTRY.

PURE-BRED STOCK v. MONGRELS—VALUE OF EXTERNAL CHARACTERISTICS—EGG PRODUCTION—LAYING OF VARIOUS BREEDS—WEIGHT OF EGGS—TABLE PROPERTIES—QUALITIES OF BREEDS—COLOUR OF FLESH AND SKIN—WEIGHT OF MEAT, BONE, ETC.—CONSUMPTION OF FOOD—DESCRIPTION OF BREEDS—CLASSIFICATION OF BREEDS.



WHILST the poultry fancier must necessarily regard as all-important external characteristics, devoting his attention to the perfection of feather or other arbitrary points, the poultry-keeper should make economic qualities the object of his consideration, only studying external points in so far as they can be the embodiment of those qualities for which he is seeking. It would be a futile waste of time and space to discuss whether pure-bred stock is preferable to mongrels. The entire position of the United Kingdom as a great breeding centre has been built up on its pure races of horses, cattle, and other varieties of stock. If mongrelism were to be preferred, then all the efforts of breeders for the last hundred years have been in vain, and when we abandon the system the better will it be for all concerned. But whilst it may be conceded that sometimes pedigree and high-class breeding is carried to an extreme, and that competition for prizes does not tend to encourage reproductiveness, the benefits of our system are too apparent to need repetition. What applies in the larger branches of stock equally does so with poultry, and we believe that it is imperative for pure races to be maintained. Without them we should waste our energies in breeding, whereas now we can conserve the qualities for which we are seeking, and by judicious breeding obtain results which would have been impossible under other conditions. External points should be regarded as determining the internal qualities of any breed only so far as they show that it has been bred to a given type. The colour of plumage is no indication as to whether a fowl is a good or bad layer, nor are the fifth toes on the Dorking and the Houdan related to their edible qualities. But correct colour of feathering tells of continuity in breeding, and although there are as good table fowls as the Dorking and better than the Houdan, who carry no super-numerary toe, we know that when these fifth toes are

met with there is a fowl in which one or other of these breeds must have a very large share. Whilst, as we shall afterwards indicate, first crosses may be recommended for reasons which will then be given, we are very strongly of opinion that purity of stock should be maintained in all its rigidity, at the same time avoiding an extreme to which many fanciers are prone to go, namely, destroying economic qualities in their haste to secure perfect show points. The most skilful breeder would be he who could retain the one and engraft on to it the other. There is, however, one fact which deserves notice, namely, that qualities overborne by external characteristics are not lost, but merely suspended. Lewis Wright emphasizes that "the knowledge, enthusiasm, and patient perseverance of the fancier are necessary to improve and maintain any breed in perfection for even the utilitarian. But," he continues, "it may still be asked, if in the fanciers' hands these breeds have lost some of even the original economic value they had, how then? The answer to this is very simple, and consists in the fact that however much these qualities have diminished, they usually reappear in all their original perfection in the first cross; and as farmers or market breeders usually employ such first crosses, which are better for nearly all purposes, every practical end is secured. Thus, supposing a strain of Brahmas to have deteriorated in laying, and a strain of Houdans to have suffered in the same way, through long breeding to merely fancy standards, and omitting to select the best layers, the chickens produced by crossing these two families will, in almost every case, reproduce the faculty in all its original perfection."* We therefore strongly urge that the basis of all breeding for economic purposes be pure stock, and that whatever crossing be made shall be within the power of the breeder.

* "The Illustrated Book of Poultry," p. 115. London 1885.

EGG PRODUCTION.

In determining what variety is most likely to suit his needs and conditions, the amplitude of choice is very apt to perplex, and may easily lead to confusion through wrong selection. Fortunately, there is a large amount of experience as a guide, and by means of this a right selection can be made. Some years ago Mons. E. Lemoine, of Crosne, a noted French poultry-breeder, whose establishment we have visited, published a most elaborate and valuable series of statistics, showing the qualities and characteristics of fowls. These we translated at the time, and though, as Mons. Lemoine pointed out, they must not be taken as exact, so far as other places are concerned, because every place varies in its conditions, but as the result of three years' careful observations and conscientious testings, these figures are important, and the only statistics afforded of this nature up to the present time. There are, unfortunately, several prominent breeds not included in the list, and whilst we have not similar tables for these, we can indicate relatively their position by other experiments made.

Mons. Lemoine's tables show: (1) Number of eggs per annum; (2) average weight of egg; (3) weight of food consumed per day; (4) quality of flesh; (5) weight of meat on fowl at six months old; (6) ditto on bone of fowl at six months old; (7) characteristics; (8) colour of chicken when hatched; (9) weight of chicken when hatched; and (10) increase of weight for first twenty days. We have not the space requisite for the giving of all the tables prepared by this gentleman, interesting though they are, but will refer to them from time to time.

LAYING OF VARIOUS BREEDS.

Respecting the egg-laying powers of the respective breeds, the following are given by Mons. Lemoine:

Spangled Hamburgs	...	239	per annum.
Pencilled Hamburgs	...	225	"
Brown Leghorns	...	190	"
Cuckoo Leghorns	...	190	"
Black La Bresse	...	160	"
Gray La Bresse	...	150	"
Barbezieux	...	150	"
Courtes Pattes	...	150	"
White Leghorns	...	140	"
La Flèche	...	140	"
Silver-gray Dorkings	...	130	"
Houdans	...	125	"
Crève-cœur	...	122	"
Langshans	...	115	"
Buff Cochins	...	115	"
Du Mans	...	111	"
Brown-red Game	...	100	"

These figures must not be taken as absolute for all conditions and circumstances, and in other places would doubtless be considerably modified. For instance, we

have always found the white Leghorn equal as a layer to any other of that family, and we think Mons. Lemoine places the Cuckoo Leghorn too high. It has also been pointed out that the Langshan is much superior as a layer to the Cochin in nearly every place, and that few find the Cochin lay 115 eggs per annum. Such facts do not weaken the effect of Mons. Lemoine's researches, but confirm them as being the result of a careful test. They further go to prove that no one breed can be relied upon to suit every condition. Some varieties there are which adapt themselves to the greater variety of circumstances, but a breed has yet to be discovered which will do equally well, no matter what the condition of food, of atmosphere, or of soil may be. The omissions from this list are important, and we wish that such varieties as are named below had been included in Mons. Lemoine's figures. Personal inquiries have led us to the belief that the numbers we now give will represent the laying powers of breeds not named above, *under favourable conditions*. We say this because good housing and feeding will add considerably to the number of eggs laid, and still more to the weight of each egg.

Andalusians	...	...	150	per annum.
Black Minorcas	...	...	180	"
Plymouth Rocks	...	...	120	"
Scotch Greys	...	...	140	"
Wyandottes	...	...	140	"
Anconas	...	...	150	"
Campines	...	...	180	"
Coucou de Malines	...	...	110	"
Black Orpingtons	...	...	120	"
Buff Orpingtons	...	...	130	"

WEIGHT OF EGGS.

It is very evident from Mons. Lemoine's statistics that his birds were excellently fed, for the weights of eggs recorded are much greater than would ordinarily be the case. In order to make a comparison, we have obtained weights of eggs from a large number of breeders, which we now give parallel with those of this French authority. In some cases we are unable to make the comparisons because of omissions on one side or the other:

	English, per dozen eggs.		French, per egg.	
	oz.		oz.	gr.*
Aylesbury Ducks	34	...	...	—
Barbezieux	—	...	...	2 208
Black La Bresse	—	...	...	2 362
Black Hamburgs	19½	...	...	—
Brown-red Game	24	...	...	2 99
Brown Leghorns	22	...	...	2 99
Buff Cochins	24	...	...	2 20
Crève-cœur	—	...	...	2 331
Dark Brahmas	28½	...	...	—
Dark Dorkings	27½	...	...	—

* There are 437·5 grains to the ounce.

	<i>English,</i> <i>per dozen eggs.</i>	<i>French,</i> <i>per egg.</i>
	<i>oz.</i>	<i>oz. gr.*</i>
Du Mans... ..	—	2 118
Emden Geese ...	87	—
Game Bantams ...	13½	—
Gray La Bresse ...	—	1 395
Houdans ...	26	2 83
La Flèche ...	—	2 208
Langshans ...	27	2 69
Malaye ...	21	—
Minorcas ...	28½	—
Partridge Cochins	25½	—
Pekin Ducks ...	39	—
Plymouth Rocks	27½	—
Rouen Ducks ...	39	—
Scotch Greys ...	29	—
Silver-gray Dorkings	27½	1 411
Spangled Hamburgs	—	1 303
Toulouse Geese ...	80½	—
White-crested Polish	23½	2 7
White Dorkings...	26½	—
White Leghorns...	27	2 99
Wyandottes ...	25	—

We do not pretend that as a rule poultry kept on ordinary farms, and fed in the usual manner, will reach such high averages as are here given; nor do we think it desirable that they should do so. At present eggs are sold by number, not weight, though a box of small ones will not realize what a box of average size will fetch. This is a rough-and-ready fashion which makes it desirable to produce eggs of an average size, as near 2 ounces each as possible. Some day eggs may be sold by the pound, when the benefits of extra good feeding will be secured, which is not the case at present, and it is useless giving away to the consumer what he does not pay for. Only one observation more is here needed with regard to the kind of eggs marketed, and that is, in many places a better price can be obtained for tinted than for white shelled eggs, in spite of the fact that the former are smaller in size than the great majority of the latter. The prejudice in favour of tinted-shelled eggs is largely, but not altogether, a mere fancy, for we believe they are the richer of the two. Still, it is mainly a matter of taste, and was explained to us by the manager of a large London dairy company as being due to the fact that in West-End houses eggs are merely an incident on the breakfast-table, but that for this reason a small, pretty-looking egg is all that they require. In his case Langshans just fitted the requirements of his trade, and he used eggs largely from that breed in the winter season. An apparently small matter like this frequently makes a considerable difference in the returns.

* There are 437·5 grains to the ounce.

TABLE PROPERTIES.

When we come to consider the question of table poultry, there are several points to be regarded. It is not enough that a fowl should have fine flesh, but it is necessary to know whether it is an easy fattener; if it develops rapidly or the reverse; and whether it is at all delicate. As a rule, the table breeds are scarcely so hardy as are laying and general purpose varieties. Mons. Lemoine thus classifies the respective breeds in his tables:

QUALITIES OF BREEDS.

BARBEZIEUX.—Flesh fine; requires mild climates and dry soil; develops slowly.

BROWN-RED GAME.—Suitable to all climates; develops rapidly; moderate sitter.

BUFF COCHIN.—Very tame; suitable to all climates; develops slowly; excellent sitter, but too unwieldy.

COURTES PATTES.—Flesh good; suitable to all climates; develops moderately.

CRÈVECŒUR.—Flesh delicate, white, and fine; requires mild climate; develops rapidly; fattens easily.

DU MANS.—Flesh fine and white; suitable to all climates; develops rapidly.

HAMBURGH.—Suitable to all climates; requires large run; very rare sitter and mother.

HOUDAN.—Flesh very fine; suitable to all climates, especially on calcareous ground; develops rapidly with crossing.

LA BRESSE.—Flesh very fine, exquisite flavour; suitable for all climates; develops rapidly; fattens easily.

LA FLÈCHE.—Flesh very fine; requires mild climate and dry soil; develops slowly, fattens easily.

LANGSHAN.—Flesh excellent; suitable to all climates; develops moderately.

LEGHORN.—Flesh indifferent; develops moderately; suitable to all climates.

SILVER-GRAY DORKING.—Flesh exceedingly fine; requires dry soil and mild climate; develops very rapidly.

These comprise all the breeds which it is necessary to reproduce from Mons. Lemoine's valuable list, but the omissions are very important, and it is desirable to supplement that gentleman's information, which we now attempt to do.

ANCONA.—Flesh indifferent; very hardy; suitable for all climates; develops quickly.

ANDALUSIAN.—Flesh indifferent; requires dry soil and mild climate; develops quickly.

BRAHMA.—Flesh moderate; hardy; develops slowly.

CAMPINE.—Flesh indifferent; hardy and active; develops quickly; most suitable for sandy soils.

COUCOU DE MALINES.—Flesh excellent; hardy; develops quickly; suitable for all districts.

FAVEROLLE.—Flesh good; hardy; develops quickly; suitable for all climates.

INDIAN GAME.—Flesh excellent; develops rapidly; suitable to most climates.

MINORCA.—Flesh indifferent; suitable to milder climates; develops fairly.

OLD ENGLISH GAME.—Flesh excellent; develops quickly; suitable for most climates.

ORPINGTON.—Flesh fair in black variety, better in buffs; develops slowly; very hardy; suitable for all climates.

PLYMOUTH ROCK.—Flesh moderate; suitable for all climates; develops quickly.

REDCAP.—Flesh indifferent; hardy; develops quickly; most suitable in hilly districts.

SCOTCH GREY.—Flesh good; develops slowly; requires dry soil; as a rule a non-sitter.

SUSSEX.—Flesh very fine; develops rapidly; better on dry soils; three varieties—red, light, and speckled.

WYANDOTTE.—Flesh fairly good; suitable for all climates; develops quickly.

COLOUR OF FLESH AND SKIN.

These statistics give no further particulars as to the colour of the skin or flesh, which is a most important point, more especially in Europe; though from a different standpoint it is equally important in America. On the Eastern Hemisphere white-fleshed fowls are regarded as the best, and dark or yellow-skinned or fleshed fowls can never command anything like the same price. With this preference we entirely agree, and for quality of flesh and delicacy of flavour we should look to the best of white-fleshed varieties.

Taking the lists we have just given, the following are the respective colours of the flesh or skin:

White-fleshed fowls—Crèveçœurs, La Flèche, Du Mans, La Bresse, Houdans, Courtes Pattes, Barbezieux, Dorkings, Old English Game, Scotch Greys, Buff Orpingtons, Faverolles.

Yellow-fleshed fowls—Leghorns, Plymouth Rocks, Indian Game, Brahmae, Wyandottes, Cochins. Such breeds as Langshans, etc., cannot be called white-fleshed nor yellow-fleshed in the same way as are the others named above, but might, perhaps, be classed as yellowish-white or cream fleshed, as also Coucou de Malines.

Dark-fleshed fowls—Hamburgs, Game, Minorcas, Andalusians, Black Orpingtons.

Here it is desirable to mention that in Britain there has been a strong prejudice in favour of white-legged fowls for table purposes, it being thought that black-legged fowls were not nearly so fine in flesh. Consequently, with the exception of one breed of old Game fowls, the only varieties fitting this prejudice are the

Dorking, Buff Orpington, and Faverolle. Happily the prejudice is dying out, for it has been abundantly proved that two or three French breeds are quite equal to the Dorking in table properties, and of these there is not one with white legs and feet; but white flesh is a necessity in the best markets.

WEIGHT OF MEAT, BONE, ETC.

We now come to a most important consideration, namely, that of the relationship between meat and bone, or other non-edible elements, important because, no matter what the size of the fowl may be, or however rapid his growth, if this is in the direction of bone or offal, no real purpose will have been served. What in table poultry is required is flesh, with only as much bone as will carry the flesh, and as little offal as possible. Here, again, we must turn to Mons. Lemoine's observations, but as yet we have none to supplement his omissions; these, however, we hope to obtain later. Mons. Lemoine shows the relative weight of meat and of bone, etc., on a fowl six months old.

	Weight of meat on fowl six months old.			Weight of bone, etc., on fowl six months old.		
	lb.	oz.	grs.	lb.	oz.	grs.
Barbezieux ...	4	10	92	4	15	0
Cochins, buff ...	4	9	0	5	4	327
Courtes Pattes ...	3	10	99	2	8	316
Crèveçœurs ...	4	9	66	4	14	197
Dominiques...	3	11	66	2	8	279
Dorkings, silver-gray	5	4	282	4	13	403
Du Mans ...	4	6	64	2	11	11
Game, brown-red ...	3	15	233	2	7	301
Hamburgs, pencilled	1	15	335	2	7	224
" spangled	2	3	236	2	7	301
Houdans ...	3	7	0	2	10	140
La Bresse, gray ...	3	7	67	2	8	163
" black ...	3	7	375	2	8	240
La Flèche ...	3	5	339	2	9	269
Langshans ...	5	4	359	5	1	78
Leghorns ...	3	15	233	2	10	140
Polish, spangled ...	2	12	348	2	8	18

CONSUMPTION OF FOOD.

In this relationship it is important to learn how much food each variety of fowl will consume, because it may be that it pays to feed well, in order to secure good results, though the table given below shows that the heaviest eaters are not those who produce the greatest amount of flesh or eggs. We remember reading what was said by an observant poultry-keeper when Cochins were first introduced, for he remarked as to this breed: "Well, sir, if you do get many eggs from them chaps' bodies, you mun put a lot of grub in their bellies." The following are Mons. Lemoine's records:

			<i>Weight of food consumed per day.</i>	
			oz.	grs.
Barbezieux	...	...	6	391
Cochins, buff	...	...	17	296
Courtes Pattes	...	...	6	391
Crève-cœurs	...	...	7	31
Dominiques	...	...	4	336
Dorkings, silver-gray	...	...	6	391
Du Mans	...	...	7	0
Game, brown-red	...	...	4	275
Hamburghs, pencilled	...	...	4	152
„ spangled	...	...	4	122
Houdan	...	...	6	391
La Bresse, gray	...	...	5	254
„ black	...	...	6	391
La Flèche	...	...	6	391
Langshans	...	...	7	31
Leghorns	...	...	4	398
Polish, spangled	...	...	4	28

From these figures it will be seen that the Cochins are by far the heaviest eaters, and probably with them would be associated all the heaviest type of Asiatic fowls. Of the others, the table varieties come next, and the laying breeds are the smallest eaters.

DESCRIPTION OF BREEDS.

It is not necessary that we should go into very great detail as to the individual characteristics of different varieties of poultry, but our purpose will be served if we indicate the leading points, and for facility of reference we give these in alphabetical order, omitting such as are of no practical use to the poultry-keeper who is seeking to produce either eggs or poultry for market.

ANCONAS.—A mottled-plumaged variety, nearly resembling Leghorns; excellent layers; medium-sized body; very hardy and precocious.

ANDALUSIANS.—A member of the Mediterranean family, which has been described as having a smallish-sized body, placed upon legs of a good length; the neck rather long, with a fine head; a large upright single comb in the cock; in the hen also large, but falling over on one side; and the cocks have large, sickle-shaped tails. Andalusians are clean-legged; colour, slate, except on the cock's neck and back, where it is dark purple, nearly black.

BRAHMAS.—Large, full-feathered birds, feathers extending down the legs and feet; small, neat heads, with pea combs; two varieties—darks and lights.

CAMPINES.—The great egg-producing breed of Belgium; resembling our pencilled Hamburghs, except that they have single combs; remarkable layers; small-sized bodies; two colours—gold and silver.

COUCOU DE MALINES.—A large, upstanding breed, quick in growth, and fattening well; largely of Brahma type; cuckoo plumage; hardy.

CRÈVECŒURS.—A French breed of great size; great

breast development; carries a medium-sized crest of feathers; legs black, but clean, *i.e.*, not feathered; plumage entirely black.

DORKINGS.—Body large and deep, and when viewed sideways almost forming a square, breast well forward; neck short and head medium; legs clean, white in colour and carrying a fifth toe; four varieties—darks, silver-grays, whites, and cuckoos.

FAVEROLLES.—New variety introduced in Normandy; made from admixture of Houdan, Brahma, and Dorking blood; good layer and fattens well; slightly feathered in legs; single-combed, but uncertain in colour as yet; very hardy.

GAME.—What are known as modern Game are not so good as the old-fashioned fighting type, which are close, compact, and hard-feathered; bodies medium in size, broad in breast; legs clean, and rather long; several varieties, of which the white-legged are preferred for table purposes. The old English type of Game is best for profit.

HAMBURGHS.—Small-sized, well-shaped bodies on longish legs; large sickle tail; full hackle, with neat head, and rose-comb; five varieties—blacks, gold-spangled, silver-spangled, gold-pencilled, and silver-pencilled, all very rich in colour; save the blacks, they lay too small eggs to be of marketable value.

HOUDANS.—Of French origin; large size, broad and massive; clean legs, pale in colour, carrying a fifth toe; head crested; plumage mottled black and white.

INDIAN GAME.—Large, somewhat heavily-boned fowls, but carrying a large amount of flesh on the breast; partridge in plumage, which is very rich in colour; clean, yellow legs; long neck and legs; small tail.

LA FLÈCHE.—Large French fowls; massive in body, deep in breast; clean black legs; neat head, with forked comb; plumage entirely black.

LANGSHANS.—Large Chinese fowls, on rather long legs; full tails, carried high; slightly feathered on the legs; comb single; plumage entirely black.

LEGHORNS.—Of the Mediterranean type; active fowls of great precociousness; legs clean and yellow; several varieties, white and brown being oldest and best known; other colours are cuckoo, black, pile, duckwing, and buff.

MINORCAS.—Also of the Mediterranean family; two varieties—namely, black and white, but the latter seldom seen; one of the most valuable breeds we possess as egg-layers.

ORPINGTONS.—Really clean-legged Langshans, which they resemble, except that the legs are not feathered. A Buff Orpington has lately been introduced, really a refined variety of the Lincolnshire Buff, found in East of England.

PLYMOUTH ROCKS.—A breed of American composition; large in body; rather big in bone; clean yellow legs; four varieties—barred (cuckoo), whites, blacks, and Buffs, the first named being most popular.

REDCAPS.—Original type of the Gold-spangled Ham-

burgh; similar in colour, not so even in markings; very large comb; hardy, and most prolific layers.

SCOTCH GREYS.—Most nearly like the Dorking in shape, and have white or speckled legs; plumage black and white.

SUSSEX.—The old type of fowl bred in South-East England; single comb, large, medium-sized body; clean white legs, with four toes; light bone; three varieties—red or brown, light, and speckled.

WYANDOTTES.—Another breed of American production, and one of the most recent; comb rose; legs clean and yellow; large-sized body; plumage laced; in five colours or varieties—silvers, golds, whites, buffs, and partridge.

Full descriptions of the various races of poultry, including those not mentioned above, will be found in the companion work on "Economic Breeds of Poultry."

CLASSIFICATION OF BREEDS.

The following is a list of breeds classified according to their leading or general qualities:

FOWLS.

Laying (or Non-Sitting) Varieties.

Hamburgs.	Leghorns.
Redcaps.	Anconas.
Campines.	Scotch Greys.
Minorcas.	Houdans.
Andalusians.	Barbezieux.

Table Varieties.

Dorkings.	La Flèche.
Indian Game.	Crevecœur.
Game.	Coucou de Malines.
Sussex.	Courtes Pattes.
La Bresse.	Du Mans.

General Purpose Varieties.

Plymouth Rocks.	Orpingtons.
Wyandottes.	Faverolles.
Langshans.	Brahmas.

DUCKS.

Rouen.	Indian Runner.
Aylesbury.	Cayuga.
Pekin.	Muscovy.

GEESE.

Toulouse.	Chinese.
Emmden.	African.
Danubian.	Arsamas.
Canadian.	

TURKEYS.

Black.	American Bronze.
White.	Cambridge Bronze.
Buff.	

Brief descriptions of the breeds of Waterfowl and Turkeys will be found in Chapters XVII., XVIII., and XIX.

CHAPTER V.

SELECTION OF STOCK.

CHOICE OF BREEDS—LINING A FOWL—BREAST AND EGG-ORGAN DEVELOPMENTS—SELECTION OF BREEDERS—
INFLUENCE OF THE PARENTS—CROSS BREEDING—HOW TO CROSS—THE BEST CROSSES—IMPROVEMENT OF
PRESENT STOCKS—ONE PEN CROSS—TENDENCY TO ENFEEBLEMENT—OUT-CROSSING—SELECTING THE BREEDERS
—SIZE OF FLOCKS.



N the previous chapter we have dealt very fully with the question of breeds, showing the special characteristics of each, and classified as far as possible their respective qualities. There should be no difficulty in determining what breed is best suited to the requirements of any reader, and the choice is sufficiently large to provide for all needs. But as there are great and widespread variations between the breeds of poultry, there are also important differences between individual members of one variety, due to the fact that they have been bred under different conditions and for different ends. For instance, if one breeder of Dorkings set himself to improve the laying qualities of his fowls, and for several years selected for breeding only those who had proved good egg-producers, he would succeed, no doubt, but probably at the expense of the table properties. On the other hand, if a second breeder devoted his care to the quality and quantity of meat carried by his birds, at the end of, say, ten years both of these families would still be Dorkings, but they would vary considerably in their qualities. This is a point which must not be lost sight of, for there are great and important variations in respect to economic qualities in all varieties of domestic poultry, though not more so than is found amongst our races of horses and cattle.

LINING A FOWL.

We want, therefore, some further guide as to the economic merits of fowls, so that in the absence of actual knowledge of any family its merits may be rightly gauged. Such a method is to our hand, as will be seen below. Of course, there are ordinary outward signs which seem to tell us of internal qualities, as, for instance, large combs are usually found on the best laying varieties, and no really first-class table fowl is found with feathered legs. But these are not enough, and they may be induced by breeding for points without

any commensurate improvement in the corresponding quality. Consequently, we have been led to seek for some other method of determining the economic merits of fowls, and the following is the result of our observations:

When we come to examine the structure of fowls, we are at once met with a fact that the best quality of meat is found on the breast. The object of all who seek for first-class table fowls is flesh on the breast, with as little as possible elsewhere. This is secured by expanding the muscles covering the sternum, and, as a consequence, development is almost entirely in that direction. On the other hand, if we seek to develop the laying powers of a hen, there is enlargement of the egg organs, for one of the best-known facts in connection with every form of life is that use increases, and disuse diminishes, size; or, as Darwin puts it: "Increased use or action strengthens muscles, glands, sense, organs, etc.; and disuse, on the other hand, weakens them. . . . The flow of blood is greatly increased towards any part which is performing work, and sinks again when the part is at rest. Consequently, if the work is frequent the vessels increase in size, and the part is better nourished."* Now, as the egg-organs of a fowl must necessarily lie in the posterior part of the body, if they are specially developed, it will be found that the entire part is large as compared with breeds or families bred for table or breast properties (Fig. 3). But it must be here pointed out that the posterior part of a hen must always be greater than that of a cock, for the simple reason that she has to provide for egg organs, and he has not. Therefore, in lining fowls this fact must be kept in view. To test, therefore, the respective qualities of any fowl, a median line should be drawn from the point of the shoulder where the neck joins it to the thigh. If a greater bulk of the body lies in front of this

* "Animals and Plants under Domestication," vol. ii. p. 285.

imaginary line, the fowl may be classed among table varieties, and its position therein will be determined by the extent of its development, though, of course, quality

the parents impress upon the chickens their own characteristics. Good points are reproduced, and if the breeding has been careful, these are improved upon

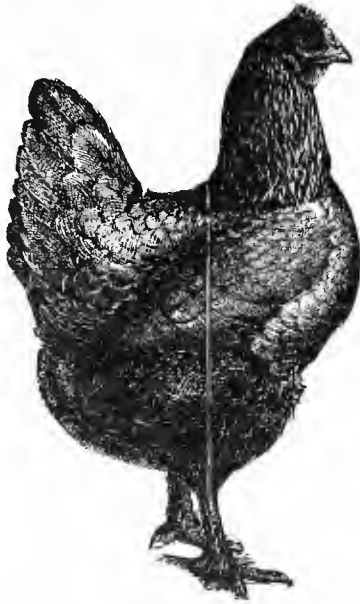


FIG. 1.—TYPE OF GENERAL PURPOSE FOWL.



FIG. 2.—TYPE OF TABLE FOWL.

and flavour of flesh are also to be taken into consideration. On the other hand, if the greater bulk of its body lies behind this imaginary line (Fig. 3), that will indicate laying qualities, these also being determined by extent. There are, however, several races of poultry whose outline is represented by the letter Y, or by the letter U upon legs (Fig. 1), in that they are almost equally balanced upon both sides of this imaginary line. Such we place in the general purpose class; that is, they do not excel either as layers or table fowls, and according to their development upon either side will be their merits in the directions named. We have carefully observed large numbers of fowls since we were led to adopt this method of testing the qualities of poultry, and have found it most reliable—nay, the only true way of determining what is a most important point.

SELECTION OF BREEDERS.

The selection of birds for breeding is a very important matter, more important than is generally regarded, as

But bad points are also reproduced, and may be aggravated unless great care is taken. By skill and know-

ledge the former *can* be increased, and the latter decreased, if not altogether removed; but it must be borne in mind that the bad qualities are apt to return if vigilance is relaxed. The poultry-breeder needs to have a clear idea as to his aim and he must ever keep that end in view. Those who have high-class exhibition poultry are most particular regarding the choice of stock birds, and will take an amount of trouble which may be regarded as unnecessary by such as are unaware of the importance of this matter. Years of careful breeding can be upset by one injudicious cross, and though the poultry-farmer need not be so particular as those

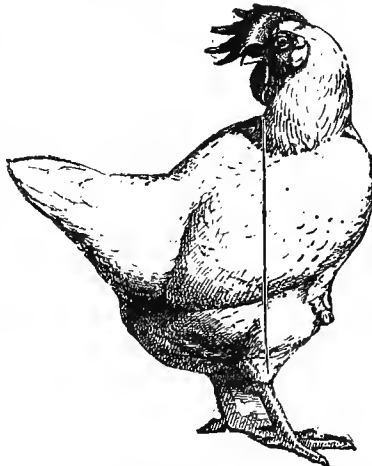


FIG. 3.—TYPE OF LAYING FOWL.

who breed merely for feather, yet it is necessary to exercise considerable thought regarding the question. It would be foolish, indeed, to spoil a good strain for want of a little forethought and trouble.

INFLUENCE OF MALE.

As the male parent influences external structure and characteristics as well as the shape of the bird, the first thing, therefore, is to see that the cock selected for breeding purposes shall be large, and by this we mean size of frame, not merely fat and feathers. A fat bird is seldom a good breeder, and there is many a fluffy-feathered one which appears to be of a large size, which when taken in the hand is found to be very light. A small bird will never breed large ones, and thus the point is most important. Then the bird should be looked at to see if there are any grave defects—that is, whether deformed in body or limbs—possessing characteristics that are regarded as blemishes in the special variety to which it belongs. However good a bird might be in other respects, it would be very foolish to select a bird so affected, as it would transmit its fault, and probably in an intensified form, to its descendants. A bird weak or deformed in its organs of locomotion would be a bad one to breed from, and, in fact, it may be taken as a rule that the bird which is shapely, of good size, and looks best, is to be preferred for breeding purposes. Many birds with defects such as we have referred to are of no use for laying or table purposes, and if bred from, these defects will not only be perpetuated, but intensified, until it will be very difficult to get rid of them. In choosing a cock to breed layers, we should select one firm and close in body, of a good size, though not abnormally big, well developed behind, as referred to above, clean and tall on leg, and active in its habits; whilst for the production of birds for table purposes it is better to pick one heavy in body, shortish on the leg, and deep in breast.

INFLUENCE OF FEMALE.

The hen, as we have seen, influences the internal structure and vital organs. Thus, it will be found that a good layer will produce good layers, a good mother good mothers, and a ready fattener those most suitable for table purposes, if—and the “if” is an important item in the calculation—the male bird is selected accordingly. With respect to hens, what has been said applies equally as with males to the selection of shapely, well-made, and good-sized birds, for though a hen may have a fault in the organs which she does not influence so much as the cock, yet that defect will almost certainly be transmitted to a greater or lesser degree. We need scarcely add that no bird with the slightest sign of disease or hereditary complaint should ever be bred from. Stamina and good condition are of equal importance to anything else in a breeding fowl, and it is courting failure to neglect these points. Consanguinity is also to be guarded against, as breeding-in soon debilitates and reduces the size.

Each of the sexes exercise a certain and defined influence upon their progeny, and knowing this we have a sufficient guide to enable us to select those we require.

The male parent influences the external structure—shape, outward characteristics, and movements of bird; whilst the female parent controls internal structure—constitution, temper, fecundity, and habits. Here are defined lines upon which to proceed.

CROSS BREEDING.

It has been found from long experience, and of the fact there is really no doubt, that for the poultry-keeper, whose object is profit, judicious crossing is a decided advantage to his pocket, in that it assists the securing of a better result from his venture than if he restricted himself to pure breeds alone. The reason for this is not far to seek, as the tendency of all pure-bred fowls that are at all carefully bred is to improve in outward characteristics at the expense of inward qualities, and this tendency must certainly be combated if success has to be attained. French poultry-breeders have managed to preserve the characteristics of their fowls, and at the same time maintain, if not improve, the economic qualities; but it is to be noted that they place the latter first. This must not be taken to mean that the outward characteristics are neglected, but that they do not make the improvement of these their chief aim, regardless of what effect may result in other ways. They know that birds which have special outward characteristics are best either as layers or on the table, and thus they look for these points and breed to them. But they give the points a much greater breadth of meaning than do British fanciers, and in judging go upon a different plan to that followed here. In a purely fanciers' show the judge regards as all-important shape, size, colour, comb, legs, and general contour, and does not usually care whether the birds are likely to make good table fowls or first-rate layers. Across the English Channel judging is exactly reversed; the points which denote economic qualities are looked for first of all, and then an examination is made for externals. At the great Paris Show we have seen good-looking La Flèche thrown out because they were rather coarse in comb, a fine comb being regarded as the sign of a superior-fleshed table fowl. A Crève with white feathers is there discarded as in an English show, these being thought a sign of impurity; but the crest is not allowed to settle matters entirely, as is too often the case here, the result of which is seen in diminished size of the fowls and lessened fecundity.

From what we have stated, it will be seen that the system of breeding adopted in England—that is, amongst those who go in for keeping show fowls—is to place first those qualities that are of the lesser importance, and hence it is that we find a deterioration in profitable qualities among some of our varieties. Recrossing very largely remedies this, for it is found that first crosses between suitable breeds at once give us hardier and more prolific birds than were either of the parents. This crossing, strange to say, is very beneficial

between two pure breeds when it is the first cross, but if persisted in afterwards, as is too often the case, without rhyme or reason, it soon results in injury to the whole stock. A pure-bred cock introduced into a lot of mongrels will improve them, but a bird so introduced that is himself a cross will not have nearly so much influence. This fact needs to be repeated continually, for farmers and others seem very slow to realize it. The thing is, however, self-evident to all who have in any way tested the question, and it is this fact which accounts for the poor, miserable specimens that we see in so many farmyards. These have generally been crossed for years without thought, except that perhaps a new cock has been introduced now and then, just as fancy dictated—sometimes a Brahma, now a Cochin, then a Game, and so on, until the produce is a mixed-up lot, and the cleverest ornithologist would be puzzled to tell what breeds have been concerned in the business.

These results, as seen in only too many farmyards, show that, whilst judicious crossing is undoubtedly beneficial, without proper consideration it is positively injurious, and does more harm than good. For instance, a Brahma has a large frame, fairly good meat, though this meat is not in the right place, is a moderate layer, and a good mother. To cross it with a Cochin, which is as large in frame and something of the same shape and type, would at once injure the quality of the flesh and impair the productiveness as a layer of eggs, and do no good as far as the size is concerned, only showing improvement in one point, if that be an improvement, namely, in the sitting quality. Leghorns and Minorcas are good layers, small eaters, non-sitters, and, being essentially laying fowls, are only moderate in quality of flesh. To cross in Game would certainly improve the quality of flesh, but it would at the same time injure their laying powers, reduce size of the eggs laid, whilst the progeny would be uncertain sitters, and not such as we should care to entrust with valuable eggs. In order, therefore, to obtain the benefits from crossing, it must be done in a proper manner, and the characteristics and qualities of the fowls mated be so blended as to best secure the object in view, or the result is certain to be a great disappointment.

HOW TO CROSS.

From what we have here stated, it will be seen that one of the first things to do is to ascertain the characteristics of the fowls which it is proposed to use, both as a breed and as individuals. In all the pure breeds there are leading points, as already indicated, that we can look for, and which are to be found in all varieties specially noted either as layers or as table fowls. For instance, all the best layers are noticeable as having large combs—large, that is, for the size of the fowls themselves. Leghorns, Minorcas, Andalusians, and Anconas have large single combs, Hamburgs and Red-

caps large rose combs, and Houdans large leaf combs, in every case this being a very prominent feature. We do not say that the comb is the unvariable sign of good laying qualities, for some Dorkings have large combs, and sometimes Cochins also, though in both these cases the comb is not nearly so large in proportion to the size of the fowls as in those breeds just mentioned. With these exceptions, it will be found that size of the comb is a pretty sure indication as to laying qualities in the birds; and in looking out for good layers this will be found a pretty safe guide when found in conjunction with a rather small body.

On the other hand, qualities which indicate the best table fowls are to be looked for in the body rather than on the head, though, as we have already mentioned, in France a small neat comb is regarded as the *sine quâ non* of a good table fowl. Dorkings, Crêves, Game, and Indian Game, which stand in the forefront of this section, have thick-set bodies, showing the greatest depth from the breast to the back, and have flesh upon the bodies rather than upon the thighs. Game fowls are now bred long on the leg for show purposes, but for producing table fowls we prefer the Old English Game type, which is much shorter in the leg and fuller in body. Both Dorkings and the best varieties of the French breeds are, or should be, of this stamp. Birds with a lot of flesh on the thighs are not well furnished with meat on the breast, and as the quality of meat on the former is decidedly inferior to that on the latter, such fowls are by no means so good for table purposes. Hence it is that Asiatic varieties, *i.e.*, Brahmas, Cochins, etc., are not regarded as first-class on the table. What is known as depth of keel should always, therefore, be looked for in selecting birds intended for table purposes.

General purpose fowls are those which, whilst not excelling in any one quality, are yet good in all. These are very useful where it is found that a fowl which is at once a fairly good layer and yet a passable table bird, pays best. Of course, in such a case as this the profit will not arise from the one quality, but from a combination. It is necessary in crossing, therefore, to remember that what is wanted is to have sympathetic breeds put together—that is, breeds which will reproduce their good qualities in an even stronger form in their progeny. Unless care is taken to secure this, the crossing will only result in greater hardness of the fowls, but will not in any way add to the profit from them. This hardness may be at the expense of some intrinsic merit, and thus be purchased dearly. We do not say that if a man has a good table fowl which he wishes to make a better layer without losing the good table quality, he cannot succeed. But, unless he exercises very great care in the selection, he will injure what already characterizes his fowls. As a rule, we may take it as certain that a really first-class layer will not be a good table fowl. There is a further point

to be kept in mind, namely, that as far as possible colour should be kept in view. Fowls of all colours never look nearly so well as those which have some uniformity of type; and though this is by no means an important matter, still it is desirable to regard colour in cross breeding.

VARIOUS CROSSES.

Below we name some of the best crosses :

FOR TABLE FOWLS.

Indian Game—Dorking.
Old English Game—Dorking.
Indian Game—Buff Orpington.
Old English Game—Buff Orpington.
Indian Game—Houdan.
Old English Game—Houdan.

FOR LAYING FOWLS.

Minorcas—Black Hamburgs.
Minorcas—Leghorns.
Leghorns (white preferred)—Black Hamburgs.
Leghorns—Houdans.
Leghorns—Scotch Greys.

FOR GENERAL PURPOSE FOWLS (Winter Layers).

Leghorn—Plymouth Rock.
Leghorn—Wyandotte.
Leghorn—Buff Orpington.

IMPROVEMENT OF PRESENT STOCKS.

When it is desired to rapidly improve present stocks, it is best to buy fresh birds and commence *de novo*, for a cock and six hens will in one season breed sufficient chickens to stock any farm of ordinary dimensions. The pullets so bred will be ready in the autumn to take the place of the oldest hens, who can be killed off just before moulting, a further supply the following season being substituted for any remaining of the older type. To secure the best results, no hen should be kept after she is twenty-seven months old, that is, ere she enters her second adult moult, for every year after her second a hen's moult becomes more prolonged, and she is longer in resuming laying.

A much cheaper method, and one which will probably recommend itself to all who have a fair number of birds on hand, because it is less expensive, is to buy a few male birds of the breed or breeds selected, and run them with a number of selected hens, breeding from these alone. If it is wished to make the table properties stronger, a cock bird of the following varieties should be introduced: Indian Game, Old English Game, Dorking, or La Flèche. If the laying is to be improved, obtain a Minorca, Leghorn, Andalusian, Scotch Grey, or Redcap cock; or if the birds are to be made better all round, a Buff Orpington, Wyandotte, or Plymouth Rock cock. In this way the quality of poultry can be improved year by year, but a fresh stock bird of the same variety must be introduced every season.

A couple of cocks with twenty young hens would be sufficient to produce several hundred chickens in one

season, the cockerels of which could be killed off for market poultry; and those of the pullets which are best in size, most rapid in growth, and most nearly resembling their fathers, should be again selected for breeding the following spring, when they should be mated with a couple of fresh two-year-old stags of the same variety as those used the year before. By continuing this process year by year, ere long the breed will become almost pure, though there will constantly reappear traces of the mongrel blood. Still, these will be fewer and fewer, for pure blood is usually greater in its prepotency. After the second or third year, two year-old hens only should be mated for breeding with a young cock, but pullets may be put to run with an old cock. Of course, if a fresh breed be introduced, all the previous efforts may be largely upset.

ONE PEN CROSS.

To many farm poultry-keepers it appears at first sight almost impossible to keep more than one pure stock of fowls, and to this notion we may attribute some, at least, of their apparent fondness for mongrels. The difficulty is an imaginary one. It is only necessary to keep the breeding-pens separate for about three months of the year, after which time all the adult hens may be run together. And this separation does not necessarily involve a heavy expense for fencing, etc. Two pens can be kept on a ten-acre field, provided that each has a male bird, with very small danger of intermixing if each pen is kept separate until cock and hens have had time to know each other. Thus, the business of maintaining pure breeds is much easier than generally supposed. At the same time, for the practical poultry-keeper there are certain advantages offered by a cross, especially one which combines egg-production and table qualities. There can be no doubt that the maintenance of a pure type tends to enfeeblement. This is seen in every form of animal and plant life. In our judgment, the advantage of pure breeds far more than compensates for the tendency just referred to, for without them we shall find more rapid degeneration due to other influences. But the fact must be kept ever in mind: crosses give us at once greater vigour, and when judiciously carried out frequently make for increased economic qualities—at any rate, for one or two generations. It will be seen, therefore, that there is a basis of reason for the general idea that crosses are better for practical purposes than pure breeds, though we could not accept such a statement without limitation of its application.

An objection is frequently raised to the system of cross breeding, in that it is supposed to be necessary to keep two lots of pure-bred fowls in order to supply the necessary stock, or to buy birds with which to cross every season. Our present purpose is to show how this can be avoided, and yet the same results obtained.

If we suppose that it is intended to cross White Leg-

horns with Plymouth Rocks, a start should be made by purchasing an over-year cock, good in size, well developed, round in body, and by no means flat-chested. He should be active, and show all signs of perfect health. A little straw tint in the plumage will be no disadvantage for the work we have in hand. The pullets should be Rocks of the year, well grown, with a fine head and not too large a comb, and if shortish in the leg they will be all the better. Small, stunted, or seedy specimens must be avoided on both sides.

Mating these together, the progeny will be half bred, that is, partaking of Leghorn and Rock elements equally, though probably the majority will show white plumage, thus taking in this respect after the male parent. The following June or July the White Leghorn cock may be sold, or otherwise got rid of, as he has accomplished his work.

A year after we may use the same Rock hens for breeding, in which case another White Leghorn cock must be secured, though he had better be a year-old bird. But if it is desired to use any of the half-bred pullets, a different plan must be followed. Under the latter circumstances a Plymouth Rock cock should be bought and mated with them. The result of this will be that the progeny will be three-quarters Plymouth Rock and one quarter Leghorn, but the influence of the latter breed will probably be more potent than these figures indicate. Out crosses usually exercise a greater influence than is generally supposed.

The following year, supposing that these last-named pullets are to be employed as breeders—and we do not see why they should not be, for crossing in the way indicated will minimize the danger of using pullets, especially if a two-year-old male bird be mated with them—a White Leghorn cock must be secured. By this means we shall redress the disproportion of Rock blood, and bring the progeny to the same exact half-bred state as in the first year. This process can be repeated year by year, simply using alternately a Leghorn, and a Plymouth Rock cock. Thus cross breeds can be secured with the minimum of trouble and expense, and a selection can be made from the pullets so long as they are mated with a pure-bred cockerel.

To make our meaning clearer, it is here put into tabular form:

Year.	Cock.	Hens.
First	White Leghorn	Plymouth Rock
Second	Plymouth Rock	Leghorn
		Plymouth Rock
Third	White Leghorn	Leghorn
		Plymouth Rock
Fourth	Plymouth Rock	Leghorn
		Plymouth Rock
Fifth	White Leghorn	Leghorn
		Plymouth Rock

* The term "out-crossing" is accepted as referring to alien blood.

and so on. Of course, it is important that the male birds purchased of the same breed shall be unrelated to those previously used. This is at times more difficult than at first may be supposed. We have no stud books in poultry, and pedigrees are not kept except privately by a few breeders, so that birds purchased hundreds of miles apart may be of the same blood. Inquiry upon this point is therefore desirable.

As it is wise for the poultry-keeper to systematize his operations, and he should never keep any birds for laying beyond two and a quarter years, it will be necessary for him to renew half his stock annually, killing off the older hens, and using in their stead young pullets of the year. To do this he must know which are two year and one year respectively. The plan suggested above will help him, if he is observant, by the colour of the plumage, though this is not a certain guide. The better way will be to ring the birds, using either copper rings or lead bands. These need not be numbered, but all hatched one year can be ringed on the right leg, and next year on the left. He will know that two years hence the birds having rings on the right leg are to be got rid of, and the chickens will be marked in the same way. The year after it will be the left-leg birds, and so on.

TENDENCY TO ENFEEBLEMENT.

Whilst we know it is essential to secure progression in all branches of live-stock, that pure races shall be rigidly maintained, and that neglect in this direction would speedily result in degeneracy, the observant student of poultry—as, in fact, all other classes of domestic animals—cannot fail to see that there is a serious danger if refinement of race be carried to an extreme. Under systems of breeding adopted when efforts are put forth for the improvement of our animals and birds there will always be the tendency to strive for such an extreme. Several races of poultry have been to a large extent ruined by reason of close or fine breeding, which has weakened them, whilst improved external characteristics have resulted in delicacy of constitution. We have no wish to express a single word that may be construed into opposition to the system of preserving and improving distinctive races, but must recognise the dangers to be avoided by such a system. From the breeder's point of view there can be no question that it is essential for species and races to be as pure as possible; and it is also the experience of stock-breeders of every denomination that thorough-bred races have exerted the greatest influence when used either pure or for crossing. Hence the importance of securing their preservation; and no one more than the practical poultry-keeper can be concerned in their maintenance.

It would, however, be folly to ignore the fact that the tendency of all races is to work themselves out,

whether bred naturally or under domestication. We see this in nations and families of the human species as well as in animals and birds of every grade. Those nations which have attained the highest positions have, as a rule, been formed through a combination of influences which in many cases postpones the inevitable result. Amongst animals and birds we have records of species which served their day and are now extinct, whilst others are undergoing the same process. In connection with poultry several examples could be cited of breeds which have risen into prominence, but have passed into entire or semi-oblivion. Notably the Spanish, the Cochín, and the Brahma come to our minds in this connection. With the greater perfection of quality there is increased refinement, to secure which a measure of in-breeding is more or less unavoidable. Probably any of these breeds would have merely maintained their position for a limited period, but it is unquestionable that the system which must necessarily be followed under domestication expedites the result to which reference has been made. It is interesting to remember that in making selection for breeding we eliminate the least perfect, and in many cases these are the more vigorous in constitution. Every poultry-breeder will have had experience in proof of this statement; and, as Darwin in one of his works stated, often variations are an indication of dormant qualities exerting themselves. Therefore uniformity of type may mean that these qualities are less potent.

It is for the reason that there is a tendency to enfeeblement in all races of poultry that we have always been ready to welcome new breeds, so long as these have qualities to recommend them from a practical point of view. Such breeds take the place of others in which the force is largely expended, and, from the fact that there is usually a considerable amount of crossing to secure such new breeds, they have a vigour which older varieties do not possess. We believe, therefore, that had it not been for the many new races of poultry which have come forward from time to time, some of which were undoubtedly themselves a mixture of older breeds, in a few years the poultry would greatly suffer, and our fowls would not respond to the efforts of the practical poultry-keeper in the way that is now the case. Many breeds of poultry owe some part of their characteristics to alien blood, and especially serviceable in this direction is what may be termed yellow blood—namely, birds which have yellow flesh and legs. These are, as a rule, the hardiest of all poultry, and in many cases they give greater size than would be obtained in other ways. In Britain much has been said as to the value of the Indian Game and Dorking for crossing purposes, and there can be no question that the greater vigour of the Indian Game means that the chickens produced by crossing that breed with the Dorking are even preferable to pure Dorkings for killing purposes. Also the

Buff Orpington, and on the Continent the Faverolle and the Coucou de Malines, all of which are white-fleshed birds, owe a great deal of their vigour to the Cochín and Brahma influence exerted in producing them.

OUT-CROSSING.

There is a way in which the vigour of our older races may be preserved. Perhaps when the method is explained it may be contended that the result will be injurious, and no one can deny that for a time, at any rate, some apparent ill-effects would manifest themselves. It has been stated that the Dark Dorking is not nearly so good as it was fifty years ago, as a result of an out-cross of alien blood. Those who make this statement are well aware that such a cross did take place, and probably are led to the conclusion mentally rather than from actual comparison. We are unable from personal knowledge to compare the Dark Dorking of the forties with those seen at the present time, but careful reading has shown that our present-day specimens are quite as large, carry as much flesh—which is in itself as white—the bone is not coarser, and in respect to flavour they are equal to specimens of the race at a previous period. We are firmly convinced that but for that infusion of blood the breed would have degenerated, and probably have lost that hold on popular favour which it still retains, due to its great meat qualities. The vigour resulting from the out-crossing has been of vast benefit, although for a time injurious effects were apparent, especially in coloration of plumage, increase of bone, and mottled instead of pure white legs. The ultimate good, however, has more than compensated for such loss. Other instances could be cited, but as they merely bear out this example it is unnecessary to give them; and we would remind readers that in the larger races of stock similar results have been met with.

The observations here made lead to the conclusion that, in order to preserve our different races of poultry, it is necessary for out-crosses to be made occasionally. How often must be determined in accordance with the individual conditions of each breed. Such crosses, if made frequently, would entirely destroy the character, altering the type permanently, and hence are to be deprecated. So far as can be judged, probably once in twenty or thirty years is quite enough. If it were possible to obtain birds of the same race bred under altogether different conditions, in order to provide fresh blood without any danger of in-breeding, there would be no need to out-cross; but everyone who has bred poultry upon scientific lines knows the difficulty which this problem presents, and there seems no alternative to that here suggested. In-breeding often takes place in spite of the utmost care, due to the fact that there is always a great run upon any strain which shows the qualities of a breed to a superlative degree. It is desirable where out-crossing is

not adopted to obtain birds from as great a distance as possible, and the common plan of buying from a near neighbour is not to be recommended. This question is, however, discussed in the next chapter, dealing with change of conditions.

It is evident that out-crossing must be carried out very carefully indeed in order that its injurious effects may be minimized, and birds of what may be termed a sympathetic nature should always be employed. Such crossing is not necessary for exhibition purposes, because in that case it is often true that the greater the refinement the more perfect the external characters. What is meant by a sympathetic nature is indicated in the following example: About twenty years ago there was introduced into the Brown Leghorn a touch of Black Red Game blood, with the object of increasing the brilliancy of the plumage. The result desired was achieved, but at the expense of size, of fecundity, and of the typical characteristics of the race. The effects of this cross are yet seen, and the Brown Leghorn of to-day is different from those met with twenty-five years ago. With the sole exception of colour, every quality was antagonistic. Leghorns are soft-feathered, whilst Game are hard in plumage; Leghorns are good layers, Game only moderate in that respect; Leghorns are poor table fowl, Game are good in flesh properties; Leghorns are round in body and shortish in the leg, Game are upright and long in leg. Thus everything was sacrificed to colour, in itself an artificial point. For a time we had brilliant coloured Brown Leghorns, but little better in size than Bantams, and showing hardly anything of the Italian type. It is against out-crosses of this kind that we protest. Recently there has been a good deal of crossing between the Black Minorca and the Black Hamburg, but here we have two breeds which are largely in sympathy, and if a touch of fresh blood were necessary to maintain the vigour of the Minorca, the Black Hamburg was the most suitable breed for the purpose, offering the line of least resistance.

Care should be taken when out-crosses are made, and the introduction of alien blood should be gradual. Supposing that it were desired to make the cross just named—that is, to introduce a dash of Hamburg blood into the Minorca—in the first place, a large Black Hamburg cock should be bred with several Minorca hens. From the progeny pullets should be selected showing the greatest amount of the Minorca type, avoiding all tendency to rose comb and small size. These, again, should be crossed with a Minorca cock, as good as possible. The next year a further selection should be made, and the pullets thus bred be mated with a pure Minorca cock. Not until the fourth generation should the out-cross be introduced among the main stock, when there will be only one-eighth of the Hamburg influence, and in some cases it would

be better to wait another year, when the proportion would only be one-sixteenth. This influence should be introduced into the stock by means of the hens—that is, selecting hens showing the purest Minorca character. In this way the needed vigour would be obtained, although now and again evidences would be apparent of the different influence thus introduced.

SELECTING THE BREEDERS.

One of the chief mistakes which is made upon farms is breeding from the entire flock instead of selected birds. Many farmers who are breeding from a hundred hens will introduce each year, say, eight or ten male birds, and take eggs for hatching from any of the hens. This system is a most wasteful one, and, moreover, retards improvement, as there is really no selection whatever. For breeding purposes the plan which should always be adopted is to select as many flocks of, say, eight or ten hens as may be required, and place with each a selected male bird. These can be put out in separate houses on the farm, and will not mix. In this way the breeding operations are controlled, and it can be insured that the best birds are bred from—the best, we mean, for practical purposes. The remaining hens can be simply kept as layers, and if one or two males are run with them there will be considerable saving. The aim and object of every poultry-keeper ought to be to breed from his best specimens.

SIZE OF FLOCKS.

For a reason which has not yet been fully explained—although, as shown in the chapter on Housing, we believe it to be largely a question of atmosphere—it is found that hens lay much better when kept in small flocks than if a large number are massed together. Twenty-five is a good average. Fifty may be preferred, as there is a less cost for houses, but the former number will give better results. Certainly they should not exceed fifty. We have frequently seen as many as two, and even four, hundred running together and sleeping in the same house, but the system is to be deprecated. The simplest mode of dividing fowls is by placing small houses about the fields, each to accommodate the number stated. If a male bird is run with every separate flock, it will be found even during the breeding season that they will not mix, the stag taking care that no other interferes with his harem. We could give many instances where the average of eggs produced was very much higher when the birds were divided into small flocks than when massed together, and they can be kept under much closer observation. It is, moreover, a mistake to breed from a large lot of hens mated with several cocks, for then improvement is very doubtful. We should breed only from the best selected, and placed by themselves for that purpose during the breeding season.

CHAPTER VI.

CLIMATE AND SOIL IN RELATION TO POULTRY CULTURE.

NATURAL ADVANTAGES—CLIMATIC INFLUENCES—MOISTURE IN ATMOSPHERE—VARIATIONS OF CLIMATE—SOIL—
EFFECT OF SOIL ON GROWTH—SUMMARY—CHANGE OF CONDITIONS.



VERY common, but nevertheless erroneous, impression is prevalent that the reason why poultry and eggs are produced to such an enormous extent abroad is that the climatic influences are more favourable than in this country. Frequently we hear this given as a reason why poultry-keeping has not developed to the extent which might have been anticipated. It is desirable, therefore, to consider this question, because natural advantages or disadvantages must determine to a large degree the branches of industry following in any country. At the same time it is notable that we are always inclined to find fault with our conditions rather than ourselves, and make excuses instead of assuming blame, exalting the opportunities of others at the expense of our own. Again and again have we been met with statements of the kind referred to, and a great amount of surprise has been evinced when it was stated that there is no part of the world more favourable for poultry-keeping than the British Isles.

It may here be asked, What is the reason that the United Kingdom has been the centre of the world for the breeding of high-class stock of every kind? We may fairly give credit to the skill of breeders and to the somewhat cramped conditions under which they must work, compelling them to make more rigid selection than would be the case in a larger and more thinly-populated country. But the skill referred to must have some explanation, and we believe that it is the direct result of the favourable conditions under which breeders have worked. Whilst, therefore, giving full credit to stock-raisers of every class for the way in which they have perfected the different races and breeds of domestic animals, it would be foolish in the extreme to claim that this skill has not been assisted by their conditions. We may in this connection ask, Why is it that our animals, and also the human beings peopling these countries, are fuller bodied and more

fleshy than is usually the case, at any rate in warmer climes? Part of this is due to the food upon which they live, but not entirely, and it is a fact that anyone emigrating from this country and remaining, say, in America or South Africa for a few years will be distinctly different in appearance from what he was at first and than he would have been had he stayed at home. This question offers a very wide field for inquiry, but it would be impossible to deal with it adequately at the present time, and we can only indicate some of the main points for consideration.

CLIMATIC INFLUENCES.

It will generally be within the observation of everyone that the temperate zone has manifest advantages over countries where extremes are met with. We must recognise that large portions of Europe and of North America, as also of Australia and New Zealand, lie within the temperate zone; but these countries vary very considerably, and our point is that the British Isles, so far as poultry-keeping is concerned, have great advantages over even the near countries of Europe. It is not generally realized that, in spite of all that can be said with regard to weather in Britain, we here do not suffer from the same extremes as upon the Continent, much less than is the case in America. It is not a question of latitude, but one of position, as we shall show below. Reverting to the impression that other countries have a better climate than our own, it will be acknowledged that Denmark and Russia, at any rate, can claim no advantages in that respect. We are prepared to say, however, that France, Italy, and Austro-Hungary, all of which supply great quantities of eggs and poultry to our markets, are much less advantageously placed than we are. Again and again when visiting France in December have we found the winter much more severe than at home, and if we take the Netherlands and mid-Germany as placed about our own latitude, it

will be found that the mean temperature in winter is many degrees colder and in summer several degrees hotter than met with at the same time in the United Kingdom. The fact is, with the exception of North-West France and perhaps the Riviera, there is no part of the Northern Hemisphere which has the same favourable climatic conditions as the British Isles. Those who have lived both in England and in the South of France can bear testimony that the influences, with one exception, are in our favour. Undoubtedly in France they have a greater amount of sunshine than we are accustomed to see, though frequently this is accompanied by very intense cold. Many people have a strange notion that the greater heat of the summer is advantageous, but that is not so. Those who have travelled on the Continent know that the intense heat burns up vegetation, and thus the supply of natural food is enormously reduced, whilst the evaporation of body moisture is met with to a greater extent, explaining why under ordinary conditions stock is much leaner during hot weather and in hot climates than in cooler weather and colder countries. Trees and plants, the roots of which are in the ground, and are thus able to tap underground springs, may gain rather than lose during a hot season, but animals can only utilize what is on the surface or in the atmosphere. Excessive heat is as disadvantageous as extreme cold, and this explains why the temperate zones are most favourable for all kinds of live-stock, whilst a moist climate, by keeping the herbage in a good state nearly all the year round, exercises a beneficial effect which has never yet been estimated at its full value. In this country it is very seldom, indeed, that there is no growth in the grass, and our fields as a rule keep green all the year round. Occasionally we have severe winters and hot summers, when natural foods, both animal and vegetable, are scarce; but these are the exception. They are, however, the normal conditions in many other countries. In North America arrangements have to be made to provide against long, cold winters, and also to meet the requirements of the birds during the hot, dry summers. Therefore, so far as we are concerned, every opportunity in respect to climate is given for the development of poultry-keeping. When we bear in mind what has been done in other countries, the greatest encouragement is afforded for the extension of our work. In Holland, Belgium, and Denmark, where large quantities of both eggs and poultry are produced, the conditions are by no means so favourable as with us, for the summer is hotter and the winter colder than here. The Scheldt is frequently frozen and not navigable when our rivers are free from ice, and we have only to traverse the plains of Flanders and Brabant during the intense heat of summer to gladly return to cooler air in England. The same conditions, even to a greater extreme, are met with in Russia;

but if we take Italy and Austro-Hungary, these countries have distinct disadvantages. The extreme heat of summer in South Europe, modified to some extent in Italy by the influence of the Mediterranean and Adriatic Seas, accounts for the small size and poor quality of South European fowls under ordinary conditions.

Reference has already been made to the effect of heat upon the body—namely, causing evaporation of moisture, and therefore hardening the tissues. It is also true that cold, by inducing elimination of the heat force, has the tendency to reduce production and increase food consumption, whilst the food must be of a more oily nature. Where it is possible, as is generally the case with us here, to secure an equable climate, then all the conditions are present for the development of any kind of stock-raising. We firmly believe that the reason why Ireland produces such fine quality butter, and also why the United Kingdom is famous for the richness of the flesh produced upon its pastures, is due to the conditions already referred to. In this connection it is well to bear in mind that even within the confines of a small country like the United Kingdom places will be found which are more suited for breeding than for feeding, and *vice versa*. That fact should be kept in view. It is seen in connection with cattle, sheep, and also is well known in respect to oysters, many of which have to be relaid because they would never fatten upon their breeding-place. Our object should be, therefore, to study the conditions both of climate and of soil with a view to adopting methods which will conduce to the greatest amount of success.

MOISTURE IN ATMOSPHERE.

We have already indicated that moisture in the atmosphere has a very important influence upon stock-raising. By this we do not mean that the action is direct—though that is open to discussion—but that where a dry air prevails (and dryness may be the result of either extreme cold or heat) the quality of the grass or other growth is affected, and the influence is seen in the flesh and eggs obtained from the fowls kept thereon. It is well known that grass is richer in moist countries, unless the moisture be excessive; that it grows perhaps less rapidly but more constantly; and that it lasts much longer. For many years fowls have been from time to time sent out to the Congo River in West Africa for the use of the European missionaries settled in that country. It is found that in about three or four years after the stock is received the progeny are so reduced in size and meat properties that fresh birds must then be imported. This is due to the intense heat within the equatorial zone, and the same is true in the greater part of India. Although the fowl originated in India, many birds have been taken from this country to improve the stock met with there, but

they lose size very quickly. Moisture fills out the body, securing that increase of size and bulk which is characteristic of nearly all life in the temperate parts of the earth, and especially those surrounded by the sea. Moreover, moisture secures for the birds a much more abundant supply of natural food, which has a constant and long-sustained influence upon their growth. If we take eggs, it is to find that in them 74 per cent. of the total bulk consists of moisture. Thus, if a hen lays 120 eggs in the course of twelve months, each weighing 2 ounces, she produces a total bulk of 15 pounds, of which nearly $11\frac{1}{4}$ pounds consist of water. The greater part of this will be obtained either from the atmosphere directly, or indirectly through the food consumed. In flesh also there is 72 per cent. of moisture, and it can be understood that dryness, either due to excessive heat or cold, must tend to reduce the bulk of flesh. At the same time we must recognise that excess in moisture is equally injurious as is deficiency, for reasons which are explained below. A very wet, cold place will mean that the birds will be subjected not only to atmospheric cold, but also to earth cold, and this will be injurious in the extreme. On the other hand, if we have a combination of very hot air with dry, hot ground, then the effect upon the animal life must be much greater than if only the air were hot. Our object should be to avoid extremes, and whilst we may have a great deal to say in condemnation of the moist conditions of the British Isles, on the whole there is no doubt in our judgment that it is beneficial, and conduces to that quality of stock of which we are so proud.

VARIATIONS OF CLIMATE.

Within the confines of one country a great variation in climate may be found, more especially in countries so diverse as the United Kingdom. Mr. Primrose McConnell, in his valuable work on "Agricultural Geology," points out that where the same conditions prevail in many cases, even though hundreds of miles apart, the stock has a uniform type. He says that "We find on the American continent, on the prairies, a region of land very similar to Eastern Europe, and this similarity tends to wipe out the differences between breeds. British breeds have a tendency there to lose their characteristics, and would in time, if allowed freedom, revert back to some common form when continuously bred under one set of geological surroundings."* Our object in calling attention to this fact is to show that the varying climate and conditions found within the British Isles is a distinct advantage, in that it gives us a variation which explains to some extent the different breeds met with in this country. Of course there are considerable variations in temperature and in climatic conditions. Some places are colder

than others, to a large extent a question of altitude and of exposure; others are influenced by the Gulf-stream; and probably in no place in the world can the same diversification be met with. In the work just referred to Mr. McConnell points out that "On the average, the month of January is warmer in the North of Scotland than it is in the Midlands, and the cold winters of some Northern and Midland districts are the result of their elevation and position, rather than any difference of latitude."* It is therefore most necessary that attention should be given to this question, because it at once indicates the importance of keeping in view the climatic conditions in making choice of the branch of poultry-keeping to be followed. In countries which are uniform we may find the same methods adopted over a very wide area, but this would be inadvisable under our own conditions.

SOIL.

Here we approach a much more difficult branch of the subject, and one which has not been given the amount of study in relation to poultry-keeping it deserves. At the same time it must be recognised that soil must have a great influence upon the animals and plants existing thereon, and it is realized to some extent, at any rate, that many of the variations met with in all animal and plant life are due to the influence of the soil. It has been suggested—but upon this point we have little information—that the coloration of our various animals and birds is to some extent due to the soil upon which they are kept. At this stage it would be impossible to express any definite opinion thereon, as our knowledge is too scanty. It has been claimed that eggs produced upon iron-stone yield richer yolks than elsewhere, and there appears to be a justification for this statement. There can be no question that whether the plumage is affected by the soil to the extent which is sometimes imagined or not, the colour of the legs and flesh is primarily due to natural causes, and it is to the lighter soils we owe those white-fleshed birds which are preferred in this country for table purpose. Of course there can be no question that breeding largely increases any tendency in that direction, but by breeding we mean the fixing of any modifications that may have been introduced naturally. Mr. McConnell, speaking of the horse, says: "Within the last 1,000 or 1,500 years there has sprung up such a vast diversity of breeds within our islands as cannot be matched elsewhere on the surface of the earth on an equal area. That the complex geological structure of these islands is at the bottom of this divergence is the belief of the present writer."† This is equally true with respect to poultry, and we may accept the statement here put forth.

It is within the observation of many poultry-keepers

* "Agricultural Geology," 1902, p. 298.

* "Agricultural Geology," 1902, p. 108.

† *Ibid.*, p. 266.

that the tendency of light dry soils is to bleach the legs and to have an influence upon the flesh, whilst, on the other hand, heavy soils deepen the colour of the legs. Our attention to this question was stimulated some years ago by the experience of a then well-known poultry exhibitor. He was a breeder of Plymouth Rocks, and had lived for a considerable time upon the heavy flat lands of East Essex. His birds were famous for the brilliancy of the colour of their legs. He afterwards removed into Surrey, where the conditions are absolutely opposite, and the result was that the birds which in Essex had been brilliant in the yellow of the legs paled greatly, and it was only in so far as he was able to put them down upon moist, heavy land that he could retain the colour satisfactorily for the exhibition pen. This observation led us to watch the question very closely, and we therefore have come to the conclusion that in selecting the breed, and consequently the branch of poultry-keeping, the nature of the soil is a most important point for consideration. Our opinion is that as there is no effect without a cause, so the variations which are met with in our poultry are the results of differing conditions. Where breeding has been carried out for a sufficient length of time to entirely change the nature, then it is desirable that the class of fowl shall conform to the conditions under which it has been produced. It may be mentioned that it is not a question of the different parts of the country so much as the soil. Dorkings thrive excellently and attain early maturity and great size in Scotland, but only where the soil is favourable, and many of the best exhibition birds of that breed come from either North Britain or North Ireland. Keeping this fact in view, it will at once be evident that breeds should be maintained upon the soil most suited to them, and that under other conditions there is greater tendency to variation. Some years ago a proposal was made that there should be an international standard of points for poultry. This we strongly opposed, believing that it is an impossibility, and that the change from one country to another must cause differences in type, and which can only be minimized by, as far as possible, keeping fowls upon the soil to which they are most suited.

EFFECT OF SOIL ON GROWTH.

It is within the observation of many poultry-keepers that there is a great difference in places as to the rapidity with which chickens can be raised. This is in some cases due to position. For instance, land facing south and having a slope of, say, 30°, would receive the greatest amount of heat; and a northern slope at the same angle would be found to be 3° Fahrenheit colder than the former. The difference to be noted is not merely a question of aspect, but also of the nature of the soil. Whilst it is true that heat and cold are to a large extent atmospheric, yet there is a great differ-

ence in the temperature of the ground itself, this being a result of its nature and formation. Mr. McConnell says:* "The difference in temperature of soils due to mere wetness or dryness is considerable. Schübler found that the average of twelve soils gave a temperature of 100·5° Fahrenheit in the wet state, as against 112·5° in a dry state, showing a difference of 12° Fahrenheit." Here we have an explanation as to why chickens are much slower in growth on heavy soils. As an instance of this, we were consulted some years ago by a farmer in one of the eastern counties as to his taking up the raising of chickens for market. On hearing that his farm was heavy clay land, we suggested that he had better go in for egg production, and pointed out that he would find that chickens could not be grown as rapidly as upon a lighter soil. However, he was determined to try, and after three years he gave it up by reason of the fact that, whilst he could fatten just as well as in Sussex, the birds never were as good. Moreover, they took from three to five weeks longer to grow to a fattening age. This observation has been followed by many others, and, therefore, in this respect also it is most important that the soil of the district shall be studied in order to determine the branch of poultry-keeping to be followed. Damp land is not suitable for fowls, though it may be good for ducks, provided precautions are taken that the birds shall have a dry sleeping-place. Heavy clay land is most suited for egg production, and it is upon the medium and light soils only that table poultry-raising should be attempted. Even upon the different soils it is desirable to study the breeds which are most suited to the local conditions, with a view to avoiding mistakes. We quote here from Mr. McConnell's work on "Agricultural Geology," a summary† showing that the temperature of the soil is influenced in the following ways:

"Sandy or gravelly soils absorb heat more rapidly and retain the heat longer than loam or clay do, and are therefore reckoned warmer and 'earlier' soils. Dark-coloured soils absorb more heat than light-coloured ones, so, therefore, peaty and humous soils are warmer and earlier than whitish, chalky soils. The more moisture in a soil, the more of the sun's heat is used in warming up and evaporating this water, so that the temperature of the soil itself will be raised more slowly, and it will cool proportionately more quickly; therefore, damp soils are cold and 'late.' The aspect of a soil, as facing south against facing north, will most affect the amount of the heat received from the sun, taking either any day of any season or the whole year. The inclination of any field will influence the amount of heat received from the sun; a plain will receive less than a sloping field inclined to the south, and a slope to the north least of all."

* "Agricultural Geology," 1902, p. 132

† *Ibid.*, pp. 134, 135.

SUMMARY.

Generally speaking, it may be taken that fowls with white flesh do best on light soils; with gray flesh and legs on medium soils; those with yellow flesh and legs on heavy soils. There can be no question that as a rule the finest eggs are produced upon the heavier lands. In respect to the above, mention is not made of sandy soil, because this is of very little use for poultry-keeping. The fact is the herbage upon any soil determines its value for stock purposes, and if the soil is not good enough to grow plant life, it is unfitted for poultry. Many people have an erroneous impression with regard to sand, and we frequently have to state that we should prefer the heaviest land that was ever ploughed to pure sand for poultry-keeping.

As to the breeds of poultry suited to climate and soil, we quote from a leaflet published by the National Poultry Organization Society the following recommendations:

Egg Production.—The non-sitting breeds are so-called because they seldom become broody. They are, as a rule, the best layers, but are poor in table qualities, except when very young. All lay white-shelled eggs.

<i>Position.</i>	<i>Breeds Recommended.</i>
Cold, exposed situations, clay soils	White Leghorns. Brown Leghorns. Anconas.
Medium soils	Minorcas. Andalusians. Scotch grays. Houdans.
Gravelly or light soils ...	All breeds named above.

Table Poultry.—The table breeds are so named because of their large size and excellent meat qualities. Eggs from game fowls are tinted in shell; others white. Most of the table breeds are sitters.

<i>Position.</i>	<i>Breeds Recommended.</i>
Clay soils	Table breeds should not be kept. Buff Orpingtons (Lincolnshire Buffs). Faverolles. Indian Game.
Medium soils	Dorkings. Game. Any of the French breeds.
Gravelly or light soils ...	

For General Purposes.—Several breeds of poultry combine egg production with meat qualities; as a rule the hens are reliable sitters and mothers, and good winter layers. All the eggs are tinted in shell. Nearly all fowls yellow-legged.

<i>Position.</i>	<i>Breeds Recommended.</i>
Cold, exposed situations, clay soil	Wyandottes. Plymouth Rocks. Black Orpingtons.
Medium soils, gravelly or light soils	Above-named breeds; also Langshans. Buff Orpingtons (Lincolnshire Buffs). Faverolles.

Crosses.—Crosses are to be recommended for special purposes, insuring vigour of constitution, and, when correct matings are made, increased prolificacy. Pure-bred male birds should only be employed.

<i>Position.</i>	<i>Crosses Recommended.</i>
Cold, exposed situations, clay soils	White Leghorn — Plymouth Rock. White Leghorn—Wyandotte. For egg and meat properties.
Medium soils	White Leghorn—Minorca. Minorca — Black Ham-burgh. For egg production. Indian Game — Buff Orpington. For meat properties. White Leghorn — Buff Orpington. For egg and meat properties.
Light soils	Indian Game—Dorking. White Wyandotte—Dorking. For meat properties.

Waterfowl and Turkeys.

Ducks		Gravelly soils in valleys most suitable; high lands not so good in summer. Peaty soil excellent, but marshy, undrained land to be avoided.
Geese		For hatching and rearing, down and hill land preferable; for feeding off, heavy arable land and medium pastures.
Turkeys		Clay or damp land fatal; should only be kept on medium and light soils.

CHANGE OF CONDITIONS.

In connection with the larger stock it is recognised that manifest benefits arise from change of conditions, but hitherto the importance of such change has not received much attention at the hands of poultry

breeders. We realize that it would not pay the latter to send their birds away during the period of growth on to a different soil, as is frequently done by breeders of the heavier type of horses; but our point is, that sometimes it is desirable to change the special branch of poultry-keeping followed, or, at any rate, to change the class of fowl kept. The latter would be preferable, but sometimes it would be advantageous, especially where the poultry-keeping has been intensive, to remove all fowls from the soil for three or four years, in order that the ground may have a rest in the same way as takes place in the rotation of crops. Our object at the present time, however, is not to deal with the matter from that question so much as to show the influence of change of soil upon the birds themselves. We have already indicated that many of the variations which take place are the result of changed conditions, but it has not yet been generally recognised that an important benefit may be obtained by the fowls when removed from one place to another. The late Charles Darwin, in one of his works, quoting the remarks of a well-known breeder, mentions this influence, and says: "It is a well-known fact that a change of soil and climate effect perhaps as great a change in the constitution as would result from an infusion of fresh blood."* He, however, shows that the change is not always beneficial. In some cases the reverse is the result, for there are instances on record where changed conditions in the case of domesticated animals have distinctly led to infertility. For instance, he mentions that † "the fowl, a native of the hot jungles of India, becomes more fertile than its parent stock in every quarter of the world until we advance as far north as Greenland and North Siberia, where this bird will not breed." Again, "... the fowl which, according to Roulin, when first introduced, would not breed at Cusco in Bolivia, but subsequently became quite fertile; and the English Game fowl lately introduced had not as yet arrived at its full fertility, for to raise two or three chickens from a nest of eggs was thought fortunate. In Europe close confinement has a marked effect on the fertility of the fowl. It has been found in France that with fowls allowed considerable freedom only 20 per cent. of the eggs failed; when allowed less freedom, 40 per cent. failed; and in close confinement, 60 out of every 100 were not hatched."‡ Infertility may, however, be due to other causes, and, as a rule, it is owing to a reduction in the virility of stock. In the temperate zones, except such birds as are kept in strict confinement, the fowl generally breeds without any difficulty. We have known, however, a race which at one place were specially characterized by great productiveness or by flesh qualities, and yet which, removed to another

place, were distinctly inferior in these various directions. The point which it is desirable for the breeder to keep constantly in view is, that variety of conditions seems to be absolutely necessary to maintain our birds in full vigour, and that one of the most important considerations is that we should as far as possible endeavour to recognise influences which will make for success.

It was suggested by Darwin that change of conditions would have considerable influence in maintaining the stamina of our races of animals and birds, for he says in another place: "It is a law of Nature that all organic beings should occasionally cross, but it appeared to me probable that the good derived from slight changes in the conditions of life from being an analogous phenomenon might serve this purpose. No two individuals, and still less varieties, are absolutely alike in constitution and structure, and when the germ of one is fertilized by the male element of another, we may believe that it is acted on in a somewhat similar manner to an individual when exposed to slightly changed conditions."*

As an instance of practical experience in this direction we quote from an article which appeared some time ago in the *American Poultry Journal*: "It is a serious mistake to keep the breeding stock in the same pens the whole year round, no matter how large and well grassed these pens may be. As soon as we break up the breeding-pens, we remove the stock to another part of the place. It does the stock a world of good this change of quarters. 'A change of pasture makes fat calves.' A change of pasture makes the fowls better. In Scotland the breeders of cattle and sheep have learned how much a change of location benefits their animals. In the Lowlands the breeders drive their stock—the breeding stock—up into the Highlands for a time each season. The highlanders annually send their stock into the Lowlands. This change of quarters puts new life into the animals. So it is with our poultry. The change does them much good. I know this, for I have thoroughly experimented along these lines. This calls up another thought in this connection. Breeders who are line-breeding their fowls, who are breeding systematically and intelligently, know how difficult it is to secure a female to use when it becomes necessary to introduce new blood. (In line-breeding we must introduce new blood through the female.) I am fully convinced that if the breeder in Iowa would annually send eggs to some fellow-breeder in a far remote section of the country—say, New England or New York, or into the far North-West—and in due time have the birds from these eggs returned to him, he could use his own strain of fowls for a far longer time than he could if this were not done. Some four years ago I became convinced of this fact, and resolved

* "Animals and Plants under Domestication," 1885, vol. ii., p. 94.

† *Ibid.*, p. 144.

‡ *Ibid.*, p. 145.

* "Animals and Plants under Domestication," 1885, vol. ii., p. 127.

to do a little experimenting. I sent a goodly number of eggs to a friend in Northern New York. The eggs hatched well, and the chickens were given splendid care. When the birds were a year old I had two females and a male returned to me. They were apparently no more strong than their full brothers and sisters raised at home, but still, they had something in make-up and appearance peculiarly their own. No one but myself, I think, would have noticed this. I had my New York friend reserve three females until they were two years old, and then had them sent to me. In these the change was more noticeable. They had partaken of their surroundings, that is all. Change of climate, different food rations, etc., all had effect. I used these birds in special pens, and have carefully noted every feature of this breeding, from number of eggs laid, strength of life-germs in eggs, strength of chicks, and all such matters. I am fully convinced that this plan is one which will greatly aid any fancier who is breeding along pedigree lines. There is no need here to go into the why and the wherefore, for this ought to be apparent. I do not hold that such breeding can be followed indefinitely, but up to the limit this plan of breeding can be followed with good results. I know this."

We must remember that the systems which are found successful in connection with plant life are in many instances equally applicable to our animals. No practical farmer would think of growing the same crop year after year upon one field, which fact has led to rotation in farming. Also in connection with gardening it is found necessary, where the ground is occupied for a succession of years with a similar crop, to use seed which has been produced elsewhere, and in that case practically what we are advocating is carried out. If the seed obtained from any crop were employed again upon the land where the crop had been gathered, very speedily degeneracy would result, and there would be both a lessened quantity and quality of produce. What is true in this case is equally so with poultry, and, in fact, were it fully recognised, much of the advocacy of fresh blood is due to the recognition by practical experience of the fact that stock kept upon the same land gradually loses its vigour and its productiveness, or, to quote the remarks of an experienced farmer many years ago, published in the *Gardener's Chronicle and Agricultural Gazette* (1850): "Nothing can be more clearly established in agriculture than that growth of any one variety in the same district

makes it liable to deterioration either in quality or quantity." Sometimes we meet with instances where fowls are kept upon land for several years, and the measure of success realized at first is not maintained. Perhaps fresh stock is then introduced, and it is found that these grow better and are much more productive. To this cause may be attributed the favour with which new breeds of poultry are frequently regarded, and often the credit which is given to the fowls themselves does not really belong to them, the fact being that the greater success achieved is due to the new conditions rather than to any intrinsic merits of the birds. We believe, therefore, that an interchange is absolutely required, and that very often the great success, both as to egg production and also to meat qualities, found when fowls are removed from one country to another, is attributable to the stimulus given under the entirely new conditions.

Many poultry-keepers when they are purchasing fresh stock buy them as near home as possible in order to save themselves trouble. Where the place from which the birds are purchased is sufficiently varied this does not matter. We know that in the British Isles there is a great diversity of conditions. Within a radius of two or three miles we may have three or four different classes of soil, and also very different altitudes. Under these circumstances the change desired is obtained, but as a rule it would be wiser to go much further afield, securing birds which have been raised, perhaps, for two or three generations under absolutely different conditions, and, as far as possible, upon different soil. We have sometimes suggested to breeders that, if possible, they should secure birds from the other end of the country. What has been stated previously in this chapter as to the uniformity of type in animals over wide areas, say in flat countries, where the conditions are very equal, should be kept in view, and the poultry-breeder will do well to make inquiry as to the soil and climate whence he is obtaining fresh stock. A further direction in which much can be done is in the raising of chickens, even upon one farm where a large area is covered. For instance, supposing that the land is undulating, or in the hilly districts comprises both high and low land, then it would be advantageous to rear the birds upon different soil from where the breeding stock are maintained. Much can be accomplished in this way to overcome the undoubted disadvantages which arise from keeping fowls under domestication.

CHAPTER VII.

HOUSES AND HOUSING.

CHOICE OF POSITION—DEMAND FOR SMALL HOLDINGS—BALANCE OF NATURE—CROPPING THE LAND—ASPECT AND LOCATION—SHELTER DESIRABLE—EAST WINDS—FOWLS IN NATURE—CHANGES UNDER DOMESTICATION—IMPROVEMENT OF HOUSING—GENERAL PRINCIPLES—SIZE—MATERIALS—ROOF—SHAPE—VENTILATION—LIGHT—HEATING—SHELTER SHEDS—FLOORS—PERCHES—NESTS—IMPORTANCE OF HYGIENIC CONDITIONS.



ON smaller farms, and where specialization is attempted, it is not always easy to adapt conditions to our requirements. The best must be made of such opportunities as present themselves. In the case of the former the branch of poultry-keeping selected should be in accordance with the soil, as explained in Chapter VI. In many parts of Britain those who desire to take up poultry-keeping on special lines have considerable difficulties in finding suitable places in convenient positions, at least within reasonable distance of the great centres of population. Frequently land can be obtained without a suitable house, or *vice versa*, but the combination of land and house is rare. House and estate agents can bear testimony to the demand for moderate-sized houses with a few acres of land, and in many districts these command rents which are far in advance of their value for practical purposes. This is especially the case within fifty miles of London and the great manufacturing cities, where they are used largely as week-end residences. The poultry-farmer whose object is profit must go wider afield, for with him rent is a question of supreme importance. Only too often there is small choice. We must take what is offered, or none at all. It is, however, important before finally taking any place to learn what are the conditions at all seasons of the year. Everything may appear favourable in the summer, but the poultry-keeper has to live there in winter also. Some years ago we were offered a beautiful house in the Thames Valley, with excellent gardens, green-houses, stabling, and several acres of land, at what appeared a low rental; but it was low-lying, and had been flooded the previous winter.

THE BALANCE OF NATURE.

During recent years indications have manifested themselves of a trend back to the land from our cities

and towns, and the question is frequently asked as to the amount of space required for poultry-keeping. It is not easy to answer such a question until it is known what are the lines to be followed. Our opinion is that no one will succeed with poultry-keeping alone—that is, crowding the ground to its fullest capacity. One-half at least should be free from the fowls for all or the greater portion of each year, in order that it may be cropped either for hay, or grain, or vegetables. The exception to this is upon fruit orchards, where the trees cleanse the soil. The dangers of overcrowding are very great—in fact, intensive poultry-farming depends for its success almost entirely, with satisfactory management, upon the preservation of that balance between animal and plant life taught by Nature's methods. Even upon small holdings, where poultry-keeping is the main objective, some other branch should be selected, with a view to the increasing of returns and avoiding the danger to which reference has been made. Our opinion is that the greatest success is probable where the poultry-farmer knows how to make the most out of his land in other ways. With three acres much can be done in breeding, if the work is systematized, but such an area would speedily become foul were it entirely occupied by the stock. Where arrangements can be made to run fowls on farmer's land, as described in Chapter III., the operations can be greatly extended, and we should be guided in selecting a place largely by the opportunities afforded in that direction. It is of supreme importance for everyone to realize the limitations as well as the opportunities of their position.

ASPECT AND LOCATION.

Where choice of different places is offered, then there can be no question that the southern slope of a hill is to be preferred. The reasons for this are clearly explained by Mr. Primrose McConnell: "A hill, or range

of hills, has always got several sides or slopes, and as the sun shines in the heavens from east round by the south to the west*—*i.e.*, when he shines at all—it follows that the northern side of a hill, besides being more exposed to the cold storms which come from the north in winter, receives much less of the sunshine, where there is any in our salubrious climate. Indeed, in the winter-time, when he is low in the heavens, even at mid-day the northern slopes may never get any direct sunshine at all. This means a very great drawback to both the plants and animals of the farm. The pastures on the northern side of a hill are more liable to become fogged up with moss than those of the same quality of soil having a southern aspect. When the slope of the ground is at right angles to the rays of the sun—*i.e.*, about 25 to 30 degrees—it receives the maximum amount of heat, but a slope of this angle would be rather steep for comfortable farming. . . . A gentle slope facing the sun is the most suitable, while a slope away from the sun is undesirable."† For second choice we should prefer south-east or south-west. An undulating country is much better than a plain, as the latter is more exposed to prevailing winds, and seldom affords much natural shelter, whilst there is greater danger of the land being damp. It is desirable to secure the advantage of such natural shelter, more especially in the shape of woods or trees, which render great service in affording protection against winds or extreme heat, both of which are equally injurious, though of the winds that from the east affects animal life most of all. Hence those whose land is exposed to the east have special need to avail themselves of such shelter as can be secured against the malign influence of the east or north-east winds.

It must not be imagined that every place is equally suitable at all periods of the year. We must, as with other branches of stock, recognise that varying seasons require varied methods. Low-lying land may be excellent in summer when the season is dry, and is much better than higher, hotter soils at that period of the year. But, on the other hand, the higher land, if not too much exposed, would be more suitable for the fowls in winter, due to its dryer nature. Also, woodland, by reason of being cooler and affording plenty of shade, providing an abundance of insect life, cannot be excelled during the heat of summer, but would be too damp, dark, and cold for fowls in winter. Where fowls are at liberty on fields, with the hedgerows and clumps of trees which are so striking a feature in the landscape, they can find both shade and shelter; but when in confinement, entire or partial, we must realize the necessity for defending them against adverse conditions. Our object should be to minimize extremes, either of heat or cold. The worst of all places for poultry, either for young or adult fowls, as for other classes of stock,

is the bare, treeless lands, open alike to the intense heat of summer and the cold blasts of winter. On larger farms the northern slope of a hill should be used in summer, but the southern would be preferable in the United Kingdom for nine months out of the year.

FOWLS IN NATURE.

Fowls in a state of nature are accustomed to roost in the trees, and all the shelter they obtain, which is very little, is what can be secured on a hillside or in a belt of woodland. Accustomed to this condition of things, they grow up hardy and healthy, or, if there be any weakly ones, they fall before the inexorable law of "survival of the fittest," and those who remain are, so far as stamina is concerned, the more vigorous. Such birds have everything in their favour, for the natural climate is warm and favourable to them. Freedom, natural food and conditions combine to make them hardy. They live according to their own instincts, not the whims or prejudices of their owners.

CHANGES UNDER DOMESTICATION.

It will be seen, therefore, that when we alter this state of things by domestication, it is imperative that we should provide for a change which must come over the birds. Everything is altered. Instead of freedom there is restriction; instead of natural food—namely, that which the instincts of fowls teach them to obtain for themselves—we substitute artificial, and as a consequence the first effect is to enfeeble the race, making it less able to resist unfavourable circumstances. But whilst that is true, it is difficult to see how it can be otherwise. Domestication of any animal has a tendency at the outset to weaken all bodily powers. Therefore we must prepare for the result, allowing Nature to adapt herself to altered circumstances, which she will do if not hindered. We must seek, by a careful study of our fowls, their habit and nature, to attain that happy mean in which they can be kept healthy, and yet be guarded by such conditions that when unfavourable circumstances arise, circumstances which they would meet by their own instincts, they may be protected therefrom. The stamina of a fowl is its reserve force. If we weaken this we must substitute some other without the fowl itself, or when a strain comes upon it there will be a collapse.

Thus it will be seen that the question of housing is of great importance. It is possible to keep fowls healthy by allowing them a large measure of freedom, and some of the hardier varieties could thrive out of doors all the year round; but they would not be fully domesticated, and we should fail to secure that profit for which we are seeking. Their reserves, which now go to produce flesh and eggs, would be spent in keeping themselves warm, and the object of domestication would be sacrificed to a considerable extent. It is essential, therefore, that they be well housed, so that

* In the northern hemisphere.

† "Agricultural Geology," 1902, p. 106.

the qualities for which they are bred may be conserved and developed, and especially that we may obtain eggs in winter. Badly-housed poultry will never pay for the trouble taken with them, any more than would badly-sheltered dairy cattle.

GENERAL PRINCIPLES.

Before we proceed to discuss the forms of house which are most suitable to poultry-keepers of various denominations, it is desirable that we should indicate what are the general principles to be applied to all these forms. It is not enough to buy or build a poultry-house, for unless the house minimizes the disadvantages of domestication and protects the inmates against the dangers to which they are subject, we shall fail to realize the benefits accruing therefrom. As has been frequently pointed out, it is unnatural to house any animal. Under their ordinary conditions they are accustomed to sleep in the open air, securing such shelter as the season requires and their conditions afford; but when we bring fowls under domestication, then it is absolutely essential that as far as possible we must defend them against their enemies and provide for the changes which the alteration in habit of life demands. Fowls bred under domestication for generations have adapted themselves more or less to the new conditions, and the result is that they cannot withstand exposure to the same extent as their more distant progenitors. One of our great aims should be to increase the winter supply of eggs, and unless we protect our fowls against the inclemency of that season, and also against the variations which are met with in so changeable a climate as ours, it cannot be expected that they will lay in the colder weather. Consequently, the question of housing becomes of very considerable importance. We need not here dwell upon the fact that it is absolutely necessary to house poultry in order to protect them against their enemies, as that is taken for granted.

SIZE OF HOUSE.

The question of the space to be allocated to each fowl in the house is now better understood than was the case formerly. On some of the old farms, where poultry-houses were provided, we find very large spaces devoted to the poultry, and there has been a tendency to once more adopt the huge house system; in fact, in the North of England we have seen houses specially built to accommodate 500 birds, and it was claimed that the saving in capital quite compensated for any reduction there might be in the number of eggs produced. The experience of later years has shown, however, that this system is an undesirable one, because, in the first place, fowls are like other animals, and when they mass together in great numbers the danger of disease is very much greater than if divided into small flocks. If 500 fowls roost in one house, and any bird be affected with disease, there

is much greater danger of it spreading through the entire flock than if the 500 fowls were divided into twenty houses, each, of course, distinct from the others. But in this connection there is an equally important point to be kept in view—namely, experience both at home and abroad has shown that the productiveness of hens when massed in large numbers is distinctly lower than when they are divided into smaller flocks. We have no doubt that this result to some extent arises from the fact that more careful selection can be made when birds are in smaller numbers, because the individuals are under closer observation, but we do not think that this entirely solves the problem. Later investigations have shown the importance of air, or rather the oxygen in the atmosphere, to every form of animal life, and that would appear to offer an explanation why birds massed in large numbers yield a smaller average of eggs than if they are divided into moderate-sized flocks. Supposing that we take a house holding 500 hens, it is at once evident that the great bulk of these birds when at roost cannot obtain absolutely fresh air; in fact, all those in the centre of the flock, when they are on the perches, must receive air that has passed over the bodies of those on the outer side, which air is—to some extent, at any rate—contaminated. But if birds are divided in small houses into flocks of, say, twenty-five each, then, by a proper arrangement of the perches, nearly every bird can receive air that is uncontaminated. When we remember that the birds are—during the winter season, at any rate—at roost more than half of the twenty-four hours, it will be evident how important is this question. We may, therefore, lay down as a principle that the number of birds in any house should not exceed twenty-five, at any rate during the laying period, the actual size of the house for this number depending to some extent upon the class of fowl kept. The smaller races will naturally not require as much space as bigger breeds, but as an average we should lay down a general principle that every bird should have 2 square feet of floor-space, so that if we take a house measuring 6 feet by 8 feet, that will allow accommodation, on the basis named, for twenty-four fowls, or, say, twenty-five. To give less than this means that they are overcrowded. It may, however, be pointed out that some of the most successful studs and herds are kept in large numbers in sheds; but as a rule, in these cases we find that the rows are long, and that there is an abundant air-space in them. In many of the best-arranged stables and cow-houses there is a passage along the front of the stalls, and two animals are not placed face to face.

MATERIALS.

Where poultry-houses are permanent and not intended to be removed, then there is no question that stone or brick houses are the best, although these

involve a considerable capital expenditure. Houses that are temporary in their character, even though they have to be frequently removed, are usually built of wood, which material must be employed where the houses are portable. There can be no doubt that wood has distinct advantages. In the first place, it is comparatively cheap; it can be easily handled; a wooden house can be so built that it is removable; and, what is more important in many cases, a wooden house built above the ground remains tenant's property. Consequently, the majority of the houses in this country are built of the material named. But in many cases, especially where houses are purchased, the wood employed is not substantial enough. In the case of portable houses, we must consider weight, and, consequently, the same thickness of boards cannot be employed as in a permanent building. Whenever possible, the deals should be $\frac{7}{8}$ inch or 1 inch in thickness, and the house should be well put together. Unseasoned timber is, of course, cheaper than properly-seasoned wood, but it brings its own trouble by pining, very often leaving gaps between the boards, which must be covered, or the birds will be subjected to draughts. It is an excellent plan, where it can be adopted, to have overlapping boards laid horizontally, as they carry off the rain better than tongued and grooved deals. If the latter are used the boards should be fastened up and down and not vertically, as under these circumstances there is less danger of water entering and making the place damp. A wooden house should be thoroughly well tarred or painted in order to keep it dry. There can be no question that a good painted house looks best, and can be made distinctly more ornamental, but the additional cost is very considerable. At the College Poultry Farm, Theale, we tar all the houses, and find that this is equally effective and certainly very much cheaper. Good gas-tar can be bought at about 4d. per gallon, and if mixed with a little paraffin oil it dries quickly. Of course, houses should be tarred over every year, which means a little additional labour. There are various other preparations made. Undoubtedly creosote is a very valuable thing for poultry-houses, and if used freely it has a tendency to keep down parasitic forms of life. A preparation called "Penetras" is very valuable for this purpose, and has the advantage of preserving the wood coated with it. What we must keep in view is that the house shall be thoroughly dry. Dampness is fatal to success, and unless the outside is protected either by paint or tar or some other material, so as to carry off the rain and not allow it to enter, it is hopeless to expect that the inmates can thrive. Moreover, paint or tar is economical in that it preserves the wood.

THE ROOF.

A mistake is frequently made in that the roof is built of the same material and of the same thick-

ness as the walls. It must be remembered, however, that heat and cold are atmospheric, and not earthy. In winter the cold comes from above, as in summer the heat, and hence the roof of any building is liable to communicate either heat or cold much more rapidly than do the walls, unless a cold wind is blowing, when that, of course, reduces the temperature by striking against the walls of the house. As a general principle, however, it is always desirable to make the roof more substantial than the walls. This does not necessarily mean that the boards used upon the roof shall be thicker, but that there shall be a double layer. In some poultry-houses that are sent out by makers the timber for the roof is thicker; in others there is a covering of corrugated iron and a lining of match-boarding. This latter is certainly the better plan. Corrugated iron used alone is bad for poultry-houses, by reason of the fact that it is a rapid conductor of heat and cold, but it has other advantages—namely, that it turns rain, keeps the place thoroughly dry, and is reasonable in price. When used, however, it should be lined with some other material. This may be thinner boarding or felting, and such a roof will make the house distinctly warmer than if only the boards are employed. As already indicated, in portable houses we must keep down the weight, and, therefore, for them we recommend the corrugated iron lined with match-boarding. For permanent houses we have a distinct advantage in that more substantial roofs may be used. The best of all is undoubtedly thatch, as this keeps the house warm in winter and cool in summer. Many of the most progressive French poultry-keepers employ thatch, and although it may entail trouble in the way of parasites unless care is taken, still, that is not at all a necessary result. Next to thatch we recommend the following plan, which we have employed for years—namely, first $\frac{1}{2}$ inch boarding, then felting, and on the top of all corrugated iron. This does not add a great deal to the expense of the roof, and it certainly keeps the temperature inside much more equable.

SHAPE OF HOUSE.

When houses are standing in the open fields, then it is much better that they should be gabled, as we find that a gabled house is warmer than one which is a simple lean-to. Of course, if a house is to stand either against a wall or where it is protected at the back by a good hedge, a belt of trees, a wood, farm buildings, or in any other manner, then the lean-to form can be used with advantage; but it is found that if a house is in the open the high back met with in the lean-to form offers a greater resistance to wind, and thus, of course, reduces the temperature within. Moreover, gabled houses are better for removal, especially when the houses are upon wheels, than the other shape. Sometimes we see houses placed out in the

fields which are very like a large A or inverted V ; but these are not so good as an ordinary square form, for a reason that will be afterwards dwelt upon—

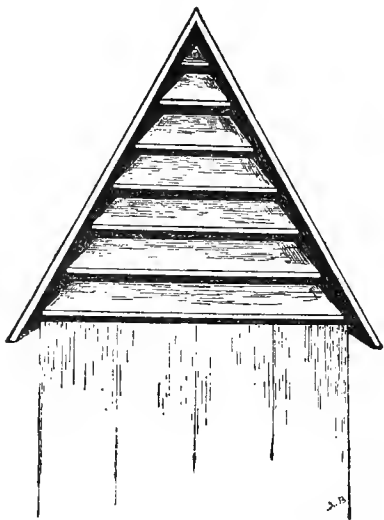


FIG. 4.—LOUVRE BOARDS FOR VENTILATION.

namely, that the birds are roosting too near the roof, and therefore are more liable to be affected by changes of external temperature.

VENTILATION.

For reasons which have already been referred to, it is most important that during the time fowls are at roost they should have a proper supply of fresh air, and in order to insure this there must be a system of ventilation which will secure a steady circulation of air through the house. By ventilation, however, we do not mean draught. In many poultry-houses this fact is not recognised, and during the prevalence of wind the birds are exposed constantly to strong draught. Under these circumstances it is small wonder that the vitality of fowls is considerably reduced, and disease results. During warm weather it is frequently better to leave doors and windows wide open ; but in colder weather, when the air has more movement and it is more dangerous, then draught should be carefully avoided. For this reason the walls of the house should be properly put together, so that there may be no interstices, and the doors and windows should be made so that they will close properly. We have to aim, not to prevent the circulation of air, but to regulate it, and here comes our chief difficulty in the smaller house. In the portable house shown on Fig. 20 a shutter forms the upper half of one side, which in this climate can be left open the greater part of the year. It may be taken, therefore,

as an absolute rule that the circulation of air should be above the heads of the birds, and that is one reason why, as we shall afterwards show, high perches are undesirable. We have sometimes been in poultry-houses which were otherwise excellently arranged, but the birds were so placed that during the prevalence of wind they were in the direct line of draught. In these days the importance of proper ventilation is well understood, and we need not dwell at any great length upon the methods of ventilation. In a small house, by means of louvre boards placed in the apex of the gables (Fig. 4), we can secure a proper inflow and outflow of air, and these louvre boards prevent any down draught upon the birds. Sometimes holes are used in this way, but the disadvantage of holes is that on hill-sides, when the wind is sweeping down the land, very often the birds are exposed to a strong draught. Under these circumstances a very simple method is to nail a triangular piece of wood upon the ends of the house to cover the holes, yet leaving a space between the walls and the wood of 1 inch to 1½ inches. Supposing that the roof projects 2 or 3 inches, if this piece of wood is nailed just under the extreme end of the roof it will allow the space already named. For larger houses a rather different plan is to be preferred—namely, that in the roof there should be a ventilating shaft (Fig. 5), which is made of wood and properly fixed, and on the four sides of this there are louvre boards, by means of which we secure a proper circulation of air, only in that case it is wise to leave a slight space between the roof and the walls for the inflow.

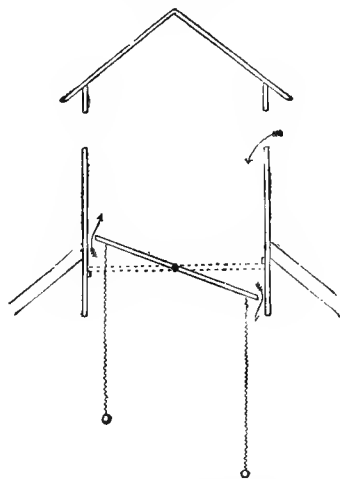


FIG. 5.—VENTILATING SHAFT.

Under these circumstances it is better to have a trap in the ventilating shaft so as to regulate the circulation, otherwise when winds are strong there will be a tendency to great draught, and consequently the air

will not circulate gently. Ventilation cannot be too carefully provided for, and the attention given to it in advance will do much to insure the health of the inmates and also yield greater results to the poultry-keeper.

LIGHT.

In the majority of poultry-houses a great mistake is made in that there is not sufficient provision for light, most houses sold having merely an apology for a window. It is a recognised fact that sunlight is the source of heat, and also that the rays of the sun purify the atmosphere. Researches have shown that bacteria are greater in number in dwellings than in the open air, and as these minute forms of life multiply enormously and very rapidly, it must be evident that unless care is taken to prevent their increase they become a very serious factor in antagonism to the efforts of the poultry-keeper. It has been found that the effect of the sun's rays, as already indicated, is to cleanse the air, for which reason during the warmer months of the year—especially in a moist climate such as we have in this country—the increase is very much greater in dark houses than in those which are well lighted. A further reason in favour of windows is so far as the warmth of the house is concerned. We have only to use our own observation in connection with human dwellings to know that a dark room during the winter season is distinctly colder than one into which the sun's rays can penetrate. During the summer a poultry-house, as also a room, facing south may be unduly hot, but that can be provided against in other ways; and it is not too much to say that during the winter season the object of the poultry-keeper ought to be to secure the advantage of whatever sunshine there may be. It is for this reason that we strongly urge a much larger window than is commonly employed. Such a window should be about midway in the wall facing the south or south-east, because during the winter season frequently there is more sunshine in the early part of the day than later on. It is better to have such a window at least 2 feet wide by 18 inches deep, and there would be no harm done if it were 6 inches more each way. A window is all the better if made to open. In portable houses it is a very easy thing to move the position of the house in accordance with the season of the year, making the window face south or south-east in the winter, and turning it round during the warmer months; but when the sun is powerful, it is better with this class of house to obtain all the advantage from natural shelter, such as a belt of trees, a hedge, or anything else possible. With permanent houses that cannot be accomplished, but other arrangements can easily be made to avoid excess of sunshine during the day. By using a piece of green holland, such as we commonly employ for window-blinds, and which only costs 4d. per house, this object may be attained, and the blind can

be taken away at the end of the summer. Perhaps it may seem rather out of place to suggest the use of blinds in our poultry-houses; but if people have any objection to this, they may cover the windows in summer with brown paper. This is not a question of fad, but of the health of the inmates, and for that reason the suggestion made is one which deserves our careful consideration.

HEATING.

We have already indicated that the main object of housing our poultry in winter is to secure a greater number of eggs, and as eggs are to some extent produced by surplus heat, many people have concluded that in order to obtain a regular supply of eggs through the winter it is only necessary to apply artificial heat. This, however, cannot be carried out successfully, especially in smaller houses. We do not say that in the case of large permanent buildings, especially those which are built square, and having a central compartment, artificial heat cannot be employed where a slow combustion stove is used. There, however, the matter can be so arranged that the heat is gentle. In small houses it is impossible to apply artificial heat without enfeebling the fowls. Animals are unlike human beings in that they cannot add to their bodily covering when they come into the open air, and therefore the difference between the inside and outside temperature should not be too great; otherwise they would feel the change very greatly, which would lead to troubles in other ways. In a small house it is impossible to distribute the heat equally, and the fowls will be found to congregate around the stove or pipes, whichever may be used, and as a result they obtain more heat than is good for them. All that we can do is to build the house substantially, and at the same time so arrange the ventilation that whilst there is a proper current of fresh air, the air shall to some extent be warmed before it reaches the birds. Taking the question of health, which is a primary consideration, the application of heat in small houses is not to be recommended.

SHELTER SHEDS.

Of late years a great deal has been said in favour of shelter sheds—that is, a covered place in addition to the ordinary roosting apartment, where the birds can be protected against adverse influences of weather and kept thoroughly dry. In our climate the great difficulty we have to contend against is in the way of variations. On the Continent of Europe and in America during the cold season the temperature is steady, and this is equally true in the hot period of the year, but one of the complaints made against our English climate is that it consists of a series of samples. We may have bright sunshine and considerable warmth in one part of the day, with change to dull, heavy

weather, rain, and a consequently low temperature, within a few hours. As we shall afterwards describe when dealing with the different forms of poultry-houses in America, where the winters are long, special provision has to be made against intense cold in order to secure productiveness in winter, but that is needless in this country. At the same time, however, shelter sheds are most important, in that they provide a dry shelter for the fowls. There can be no doubt that if birds get their feathers wet and have to hang about, especially when they are in restricted areas, the vitality is reduced and they are more liable to disease. The form of shelter shed will, to a large extent, depend upon the class of house. In permanent

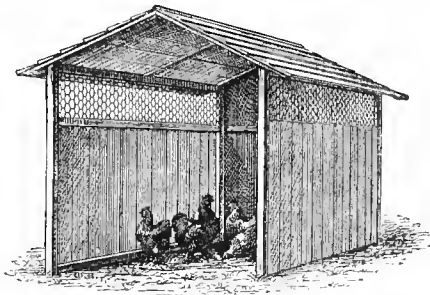


FIG. 6.—SHELTER SHED.

houses it is very easy to arrange that there shall be, in the way described later on, a covered yard which may be entirely open or netted in front, but in portable houses this is not so easily arranged. Many makers of poultry appliances use raised floors in order to afford a shelter beneath, but, for reasons which will be dealt with in the next paragraph, these are not to be recommended if they can possibly be avoided, and it would be better to build in connection with the house an addition which can be moved separately from the main building, and in this way provide sufficient shelter. Whenever one of these sheds is added to any poultry-house, it should be so placed that the birds will be protected against wind and driving rain, and therefore should be upon the side which is the least exposed.

FLOORS.

There can be no question that a great amount of disease is caused by the excreta from the fowls being allowed to remain upon the floor, and give off gases which are poisonous. At the same time, this fact is by no means so fully realized as should be the case. It is customary only to remove the manure twice a year in many parts of the country, the common impression being that during the winter season the birds are much warmer if the manure is allowed to remain. Such an idea should be sternly dealt with, because it is gaining in one direction much less than is lost in another. Speaking with regard to floors generally, here, again,

much will depend upon the class of house, and whether it is portable or fixed. In the latter case the question is a very simple one. Supposing that a wooden structure is to be built, it should be raised upon a couple of courses of brick, thus lifting the walls about 9 inches above the ground. The space inside the bricks should be filled with either gravel, burnt ballast, small stones, or even sand well beaten down, so as to form a fairly level surface. This will obtain from the ground all that is required in the way of natural heat during the colder months of the year, and at the same time avoid dampness, which in many places is the great difficulty. Such a floor will give a firm bed and prevent any danger in the direction just mentioned. The floor may be kept covered either with dry earth, or with what is still better, peat-moss litter, which is one of the most valuable materials used in connection with poultry-keeping. It is dry, a deodorizer and an absorbent, and if raked over daily so as to cover up the manure falling from the birds when upon the perches, it will last for several months, as it dries the manure and holds the ammonia. We have had in some of our poultry-houses a bed of peat-moss litter down for the greater part of a year, and without the slightest smell, but of course care was taken in the way already indicated, and now and again a little disinfectant powder, such as Izal, was sprinkled over the litter. As soon as we discerned the least odour within the house, the litter was removed, when it is found very valuable either upon the farm or in the garden. For permanent houses we know of no better system. Many people appear to think that cement is good for poultry-houses. There can be no question that it keeps the house dry, but cement is very cold indeed, and reduces the temperature considerably. Some years ago, in the North of England, complaint was made by the poultry-man of a well-known Baronet that he could not get any eggs in winter, but on covering the cement floor with peat-moss litter a change very speedily came about in this direction. Bricks may be used, but they must always be kept well covered with either dry earth or peat-moss litter. Bare bricks are objectionable in that they absorb the ammonia from the manure, and in process of time would become so charged as to taint the atmosphere in the house.

When we come to portable houses there is a great difficulty arising. For a long period of time it was almost necessary to have a wooden floor to facilitate removal, for if the house were placed upon wheels there was bound to be a space between the walls and the ground, and this meant draughts, which must be absolutely avoided. The reason why we do not like wooden floors, even where they are kept covered with either dry earth or peat-moss litter, as should always be the case, is because the nearer we get to the earth the cooler is the house in summer and the warmer in winter. It is found by experience that when a raised

floor is employed the cold bank of air below makes it very much colder than if the ground were the floor. In portable houses it is much better if we can avoid using any floor at all, because the manure then falls directly upon the ground, and a good deal of labour is thus saved. Lately there have been introduced houses which, whilst upon wheels and therefore portable, are so arranged, by raising and lowering the erection, as to avoid the draught underneath, to which reference has been made, and of these we speak in detail later.

PERCHES.

Fowls under natural conditions roost in the trees, and generally get as high up as they possibly can. It is for this reason that many people have thought that when the birds are placed under cover the perches should be raised as high as may be. A modification of this has been in the old ladder form of perch, one end of the uprights resting upon the ground, and the other against the wall. There can be no question that this form of perch enabled more birds to be accommodated in the same space than if they were upon one level, but it is not a form to be recommended. In the first place, the birds fight to be upon the top row, frequently knocking each other about; second, those upon the top rows are exposed to draughts, if there is a proper system of ventilation; third, in small houses they frequently injure themselves in flying down; and, fourth, much disease is caused by the birds perching too near the roof. It must be remembered that the weakest part of the body in all animals is the back, for the liver lies near thereto. During the autumn season of the year, if a bird is on a high perch, and its back is near the roof, should there be during the night a sudden drop of temperature, say several degrees of frost, this strikes through the roof directly upon the backs of the birds, and thus a chill in the liver is caused. It may be taken, therefore, as an absolute rule that there should always be at least 4 feet of air-space between the backs of the fowls and the roof, and it would do no harm if the distance were 5 to 6 feet. This bank of air lying between the back and the roof is sufficient to avoid chills in the way indicated. For other reasons it is better that all the birds should be upon the same level, and not more than 2 feet from the ground. The nearer the birds roost to the earth, the cooler in summer and the warmer they will be in winter.

So far as the perches themselves are concerned, they may be made either of fir-poles cut in half, not more than 2 inches in diameter, and with the edges off, or of pieces of quartering, 2 inches by 1 inch, with the corners taken off, as already indicated. In houses of moderate size it is better to have sockets in the walls and drop the perches in, so that they can be easily removed; but in larger houses a frame can be built,

into which they are dropped in the same way. All perches should be removable to facilitate cleaning.

NESTS.

In many poultry-houses, especially permanent farm buildings, fixed nests have been built, and whilst they have certain advantages, at the same time it is much better that nests should be removable to facilitate cleaning. There is no question that nests are frequently harbourages for vermin, and unless they are kept thoroughly clean a great deal of trouble arises in this way. The plan we adopt is to have three or four nests built together, without bottoms, standing upon shelves at one side of the house. When these are lifted up the whole of the contents drop out, and thus they are easily cleaned. The top row of nests should have a sloping cover, so as to prevent the birds roosting thereon, and there is no reason why two or three rows of nests should not stand one above the other, provided, of course, that the recommendations already made are observed. Nest-boxes should be lime-washed out, and the straw used in them removed often, in order to avoid the trouble resultant from parasites. To sprinkle a little of the Izal powder referred to under the straw is a very excellent plan. Where it is possible—but this can only be adopted with advantage in connection with fixed poultry-houses—it is much better to have a separate laying compartment. Hens prefer to be quiet and undisturbed whilst they are upon the nest, and if they have such a separate laying-house it is preferable in every way. Of course, in portable houses this can hardly be done without unduly adding to the size, and consequently to the weight, of the structure. In some of the portable houses there are fixed nests, placed upon the outside, access being obtained by the fowls to them from the inside, but the eggs can be collected without going into the house. This is by no means a bad arrangement, provided that the bottom boards are hinged and made to drop for the purpose of cleaning. We all know how difficult it is to remove the dust or dirt out of any square box where it cannot be turned upside-down, and it is this dust and dirt that we have to fear. As a general principle, also, it is better to raise nests a little above the ground, so that the inmates are—to some extent, at any rate—free from observation and from the interference of their companions, and to place them on the dark side of the house.

THE HYGIENE OF POULTRY-KEEPING.

One great reason why it is essential that the hygiene of poultry-keeping should be studied arises from the enormous increase in the number of fowls kept. As the population of the earth increases, and the demand for food relatively advances, it is essential that there shall be greater intensity of cultivation in connection with plant life, and that a much larger number of

animals shall be kept in order to provide food for their owners. It would be difficult—in fact, impossible—to compare the number of fowls under natural conditions with those under domestication, as observations of this kind do not appear to have been made in the past; but we know very well in connection with larger animals that at one time the relative proportion per acre of stock of different kinds was very much less than is the case to-day. Amongst the nomadic tribes in former times, when they wandered wherever they thought fit, the proportion of animals maintained must have been very small in consideration of the area travelled, and even in later days, ere the enclosure of land was carried out to such a large extent, the stock maintained must have been considerably less than is found under modern conditions. In connection with poultry we find that this is equally true, and yet at the same time, although considerable developments have taken place in the methods of poultry-keeping, still, the birds are not scattered about to the extent that would minimize the difficulties to which reference has already been made.

The first and probably the chief danger we have to avoid is in the direction of tainted soil, due to the manure produced by the fowls. It has been shown that a well-fed domestic fowl will produce from 150 to 200 pounds per annum, varying considerably in accordance with the feeding, as in the case of cattle. This manure is of considerable value in connection with the cultivation of the land, but that is not the point that we have to consider at the present time; it is treated later on. Professor Warington thus describes the feeding of the crops by manure. He says: "As soon as land is brought under the plough the oxidation of the organic matter previously accumulated commences. The vegetable and animal produce of the land are also now consumed off the soil which has reared them. Provision must consequently be made, sooner or later, to return to the land a part at least of the plant-food removed from it, if permanent fertility is to be maintained. Hence the necessity for manuring. The most complete return to the land would be accomplished by manuring it with the excrementa of the men and animals consuming the crops. This is partially done by the application of farmyard manure; but the congregation of men in cities, and the difficulty of employing sewage with profit, prevent this plan being thoroughly carried out. The farmer is thus generally obliged to purchase manures for the land in exchange for the crops and stock sold off it. On very poor soils it is necessary to make a very complete return of all the elements of plant-food removed by the crops, but in most soils there is an abundance of some one or more of these elements, and a partial manuring will consequently suffice. With high farming the contributions to the soil may be in excess of the exports, and the land consequently increase in fertility."* Such

* "The Chemistry of the Farm," 1891 edition, pp. 30, 31.

represents the ideal state of things where the requirements of the land are supplied in the shape of manure, or where the manure itself is so transformed as to provide food for the animals existent upon it. This is what we may term the balance of Nature, that one form of life leans upon other forms; the waste product of one is the food of the other, thus maintaining an equality, and preventing an undue enhancement of one to the danger of the other. But in order to secure this balance of Nature it is absolutely necessary that each of the elements shall be transformed and utilized in order that they may yield the results to which reference has been made. In connection with stock-keeping it would appear to be very evident that nearly all the diseases to which animals and birds of various kinds are subject are due to upsetting this balance of Nature, and chiefly in the direction of supplying to the land a greater amount of manure than it is able to utilize. As Professor Warington points out in the quotation we have made, by high farming the soil may increase greatly in fertility, but if stock is kept upon the land this can only be carried out to a given extent. As soon as the soil is enriched beyond its power to assimilate, then we have the conditions which directly induce disease. Manure in itself may be a poison to animal life, and thus is seen the need for utilizing the excrement of the fowls. If a very large number of birds are kept upon an area too restricted for their number, that soil will be unable to utilize the manure, and thus in process of time it becomes charged with elements which are injurious to animal life, or produce other elements having the same result. The loss arising in this case is very considerable.

Where fowls are kept in confinement, such loss will be greater than upon farms. It is frequently the case in poultry-yards that every blade of grass is absolutely killed, and the top crust of the soil becomes little better than manure itself. Under these conditions we can easily understand how disease is certain to result and great loss ensue. In connection with agriculture, however, there is no excuse for that state of things. The demand upon all cultivated land is more and more for manure, in order that it may become of greater fertility. Consequently, if the birds are properly scattered about and not concentrated upon one place, so that their manure is widely distributed in accordance with the needs of the soil, then the benefit must be considerable; but if the same fields are used year after year, or the birds are simply kept about the farmyard, then in process of time the ground becomes tainted, and disease is bound to result. As an instance we may mention that some time ago we visited a farm in the North of England where large numbers of turkeys are kept, and the birds were in a hopeless condition, simply dying off from a disease very similar to roup in ordinary fowls. The explanation was that for many years the young turkeys had been reared

upon the same field, and thus it had become what we may term "turkey sick." We have only to mention this matter to stock breeders of all denominations for them to understand how important it is that care shall be taken to avoid tainting the soil.

It is especially necessary that, under our modern conditions of poultry-keeping, great attention shall be paid to the hygiene in respect to the poultry-house. Formerly, when only a few fowls were kept about the homestead, and they were allowed to roost in any building that was available, probably an open-fronted shed, there was not the same danger that presents itself at the present time any more than there was in connection with human beings; but with the increase in the number of poultry, the desire to advance the production of the hens, and the want of realization of the importance of applying the principles which are found necessary in connection with other animals, have induced a great amount of disease. Later observations have shown that many diseases are directly the result of want of fresh air, and in our desire to improve the productiveness of our fowls and to keep them comfortable during the colder months of the year, we have transgressed greatly a law which is only now being fully realized. Of course, we must not go to the other extreme, but our wish should be to secure a proper supply of fresh air without undue exposure. In this connection we may explain what has too often been forgotten—namely, that the atmosphere is a primary source of food to animals, and that the amount of oxygen obtained is very much greater in weight than the food. The following quotation from Professor Warington explains what takes place during the process of respiration: "The blood is supplied with oxygen during its passage through the lungs, where it is brought into contact with air. The oxygen is absorbed by the hæmoglobin, which forms the chief constituent of the red blood corpuscles. The scarlet blood thus produced is circulated through the whole body by the arteries; the oxygen it supplies is consumed in the tissues, producing, among other results, heat and mechanical work. The blood finally returns from the tissues by the veins. The hæmoglobin has then lost its oxygen, and has assumed a purple colour; the blood-serum also contains carbonic acid gas in solution and many other products of decomposition.

By passing again through the lungs the carbonic acid is more or less completely discharged, and a fresh supply of oxygen obtained."* The carbonic acid gas which is discharged by the lungs in itself has a similar relation to the respiratory system that the excrement has to the digestive organs—namely, it would induce disease if the animal were compelled to reabsorb it. It is for this reason that badly ventilated houses are always so dangerous to health, and there can be no doubt that a great amount of disease in connection with animals of every kind is owing to the fact that there is no provision for a supply of fresh air, and as a consequence the animals are compelled to rebreathe the carbonic acid gas over and over again. One cannot too strongly impress the necessity for paying attention to this question, and it would undoubtedly be better to have rather more air than is absolutely required than any deficiency.

Reference has been made above to the necessity for avoiding odours arising from the emanations and keeping down parasitic forms of life. This is primarily a question of cleanliness. Unless the houses are kept clean it is impossible to expect that the air will be sweet. We might make the most perfect arrangements for a supply of fresh air in our houses, and yet by neglecting certain precautions cause the air entering the house to be tainted. The other point to be named in this connection is that, when fowls are kept in houses, there must always be a greater tendency to the increase of parasitic life than if they are under natural conditions, and it is only by rigid care that the troubles which these pests bring can be avoided. How this may be done need not delay us long, because the plentiful use of lime-wash, and especially if mixed with fat, with cleanliness in respect to the manure, will prevent all difficulty in this direction, and by keeping the birds free from the misery which parasites induce they will thrive better and be the healthier. To briefly summarize these two points, it may be stated that although the keeping of fowls in houses is necessary to increase productiveness and protect them from their enemies, at the same time they will be healthier and better altogether under natural conditions unless care is taken to protect them in the way indicated.

* "The Chemistry of the Farm," 1891 edition, p. 85.

CHAPTER VIII.

HOUSES AND HOUSING (*continued*).

PERMANENT HOUSES—SCRATCHING-SHED HOUSES—LAYING COMPARTMENTS—TRAP NESTS—FENCING—PORTABLE HOUSES—RISING WHEELS—ADJUSTABLE WHEELS—PROTECTION AGAINST FOXES—COTTAGERS' POULTRY-HOUSES.



THE system formerly adopted of housing poultry in one of the farm buildings, and allowing them to wander about the homestead, was only suitable where the number was strictly limited. With the extension of poultry as farm-stock, and a consequent increase in the number kept, that system would soon bring disaster. Not only is this a question of accommodation, but also of insuring the fowls such conditions as will secure health and avoid disease. Tainted soil, as

every case where the principle of sweet runs has been neglected. We know of no method of treating land to avoid the result indicated. Only by the natural method of cropping can the injurious elements be removed, and the land brought once more into a state favourable to the animals living upon it. The same conditions are met with in connection with larger stock. But for the method of keeping only as many animals as the land can carry, and of maintaining those in excess of that limit under cover, and of regularly removing

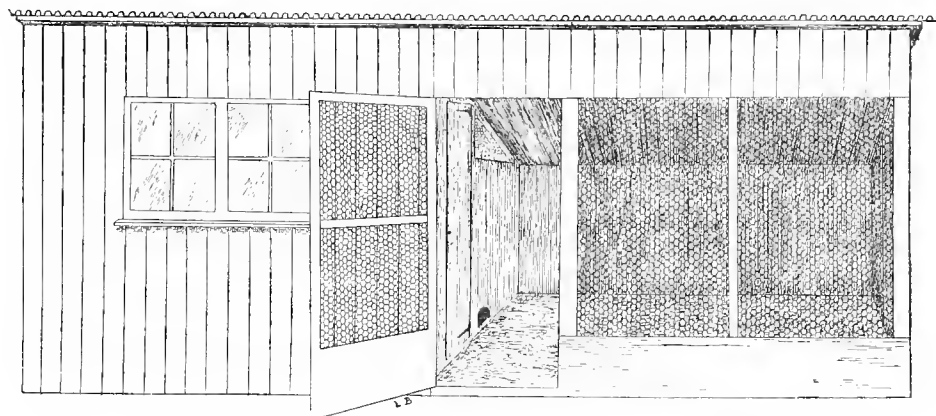


FIG. 7.—LARGE SCRATCHING-SHED HOUSE—FRONT ELEVATION.

we have previously explained, must be specially guarded against where considerable numbers are kept. We can afford largely to ignore the danger of tainted soil when fowls are widely distributed about the farm, and they are moved from field to field in accordance with the rotation of crops or the season of the year, but that must be the primary consideration when they are kept thickly upon one place.

PERMANENT HOUSES.

Many attempts have been made to solve the problem of intensive poultry-keeping, but they have failed in

the manure from stables and byres, it would have been impossible to increase to the extent which has in some measure provided for the needs of our enormous population. The question for us to consider now is whether what is known as the "soiling system" can be applied profitably to poultry-farming. If it can, an opportunity is afforded for extension that has hitherto been denied. By the soiling system is meant the keeping of fowls for part of the day under conditions where the greater part of the manure produced by them does not fall upon the land, but where it can be gathered and utilized in other ways. The method we are about to

describe is arranged with this object in view, so that permanent houses can be used, and fowls run over the same ground year after year. From the experience of several years in testing this method, we believe it can be successfully carried out; but not in the United Kingdom to the degree claimed as possible in America, where the climatic conditions are so different. Across the Atlantic, where the ground is locked up by frost and snow for several weeks in winter, and in summer dried up owing to extreme heat, during about one-third of the year the manure will have no injurious effect upon the land, and can be easily removed; but in this country it is seldom that for one week out of the fifty-two there would not be an active influence exerted by the ammonia, and in a moist climate removal of outside manure is much more difficult and less complete than is the case in America. The conclusion we have come to is that grass runs must either be larger than are found necessary in America, or they must be given a rest for several months once every three years, and then be closely cropped. Under these conditions we could not keep more than half the number per acre which is claimed for the "scratching shed" system, as it is called. That system is not necessary where there is an abundance of space available, and promises to be chiefly adopted by specialists who go into poultry-keeping upon intensive lines, and who do not wish to occupy large areas of land.

SCRATCHING-SHED HOUSES.

In connection with the College Poultry Farm, Theale, two forms of scratching-shed houses are employed: first, upon the American plan, of which Fig. 7 is the front elevation, and Fig. 8 the ground-plan. This consists of a building 18 feet long by 10 feet wide, sloping to the back, and with a front 7 feet 6 inches high, so as to obtain all the sunshine and consequent warmth possible. The building thus contains a super-

ficial area of 180 square feet, and is divided into two portions, the dividing partition being netted in the upper part—namely, the roosting place and laying compartment, 8 feet wide by the full depth, and the scratching shed, under the same roof, which is 10 feet square. In the front of the roosting-house is a large window, and if the erection faces south, or even south-east, this makes a considerable difference to the warmth in winter, and it is easily and cheaply covered with green holland for coolness in summer. The front of the scratching shed is wire netted, so that the birds can

be kept entirely therein whenever necessary, a door allowing them to pass into the roosting-house. In America, where deep snow-drifts are common in winter, it is customary to have a frame covered with fine glazed muslin behind the netting, which keeps out the snow but admits the air. This, when not in use, is hung up against the roof, and thus is out of the way. In this country such an arrangement is needless. As a house of the size named is intended to accommodate twenty-five fowls, it will be seen that the space under cover is ample; but, of course, birds restricted to it for any length of time would not obtain much exercise. To overcome this serious difficulty, one which might prove fatal, the floor of the covered run, which is gravel or other suitable material well beaten down, is thickly

littered with chaff or straw, and, as the feeding corn is thrown amongst it, the fowls have to work to find their food. Hence the name "scratching shed," and we have been assured by those who adopt this plan in America that they can keep birds healthily in this way for two or three months during the winter without serious trouble, while the protection afforded makes a considerable difference to their productiveness, and insures laying nearly all the time.

But equally important is the outside run. This differs considerably from what we have been accustomed to. For reasons of economy, in fencing the usual plan

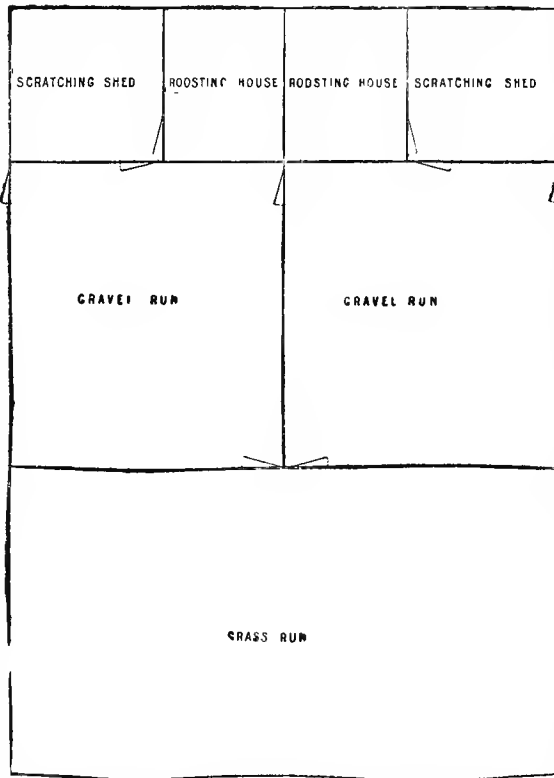


FIG. 8.—LARGE SCRATCHING-SHED HOUSE AND RUNS—GROUND-PLAN.

followed has been to make runs square, or nearly so. But it is found that the same amount of ground will be much more rapidly bared of grass when square than if long and narrow. The reason for this is that the ground near to the dwelling-place is trodden over much more frequently than that which is further away. Consequently, by adopting the long narrow runs, there is a much greater chance of preventing the ground becoming tainted. The importance of such an arrangement cannot be too often emphasized, even though it is recognised more than it is adopted. For 20 feet from the house this run is laid down in gravel and well rolled, and there is one such enclosed yard to each house. Beyond the latter is a grass run, planted with trees, 100 feet long by 36 feet wide, and serving two houses, the inmates being allowed upon the grass in rotation. It will be seen that a superficial area of 2,340 feet is provided for each lot of fowls. It is claimed that the fowls will not eat off the grass very closely under these conditions. In fact, so luxuriant is the growth that it requires to be mown or eaten off at least twice a year. Where that is so the danger of tainted ground is greatly minimized.

We have adopted a modification of the above system, enabling us to keep breeding pens and smaller flocks of birds in one house. This is shown in the second ground-plan (Fig. 9). In this case each house is 9 feet by 10 feet, and consists of three compartments—namely, first, the roosting place, which is 6 feet by 4 feet; second, the laying house, 3 feet by 4 feet; and, third, the scratching shed, 6 feet by 9 feet. The space here given is sufficient for a pen of ten or twelve birds. The outside runs are, of course, modified accordingly, as the gravel runs are 20 feet by 9 feet, and the grass

run for three houses are 100 feet by 27 feet. The advantage of having a separate laying house is, of course, obvious, and, wherever possible, we believe it would be an excellent plan to always provide separate accommodation for the hens when laying.

The idea of the method here briefly described will be evident from what has been stated already, and it will

be recognised that the gravelled portions both inside and outside the house will receive the greater part of the manure, and therefore must speedily become affected, unless steps are taken to avoid it. In the moist climate prevailing in Britain much of the manure would be washed through the gravel, but even then enough would be left to cause harm. Consequently, every day the covered and outside gravelled runs are carefully swept, the labour of which is more than compensated by the manure thus saved, though that is not the primary object. If systematically carried out, a run so treated should be kept as sweet and clean as a cattle-shed, and much of the success attained will depend upon how the work is done. As the gravel, especially in wet weather, will receive a portion of the manure and hold it below the surface, the American plan is to remove this entirely every autumn and lay down fresh; but two lots suffice to keep each run going, for if that removed is heaped

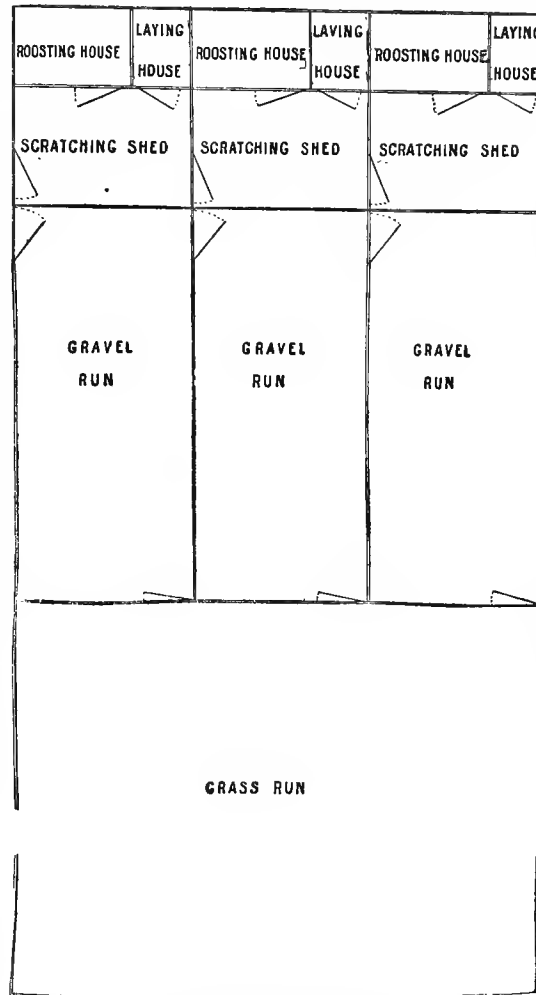


FIG. 9.—SMALL SCRATCHING-SHED HOUSE AND RUNS—GROUND-PLAN.

up and exposed to the elements for twelve months, it can be used again, as by that time it is perfectly sweet. Thus the expense involved is by no means so great as might at first be anticipated. The roosting compartment should be well littered with peat-moss litter or dry soil, raked over every day, and removed whenever necessary. It will be seen that this question of cleanliness is of supreme importance, equal in every way to

the keeping of the runs sweet. With so many fowls in a limited area, it must be evident that they will be more readily affected than when at full liberty, and

An attempt has been made during recent years to test the laying qualities of various hens, and the provision of a separate laying compartment helps materially

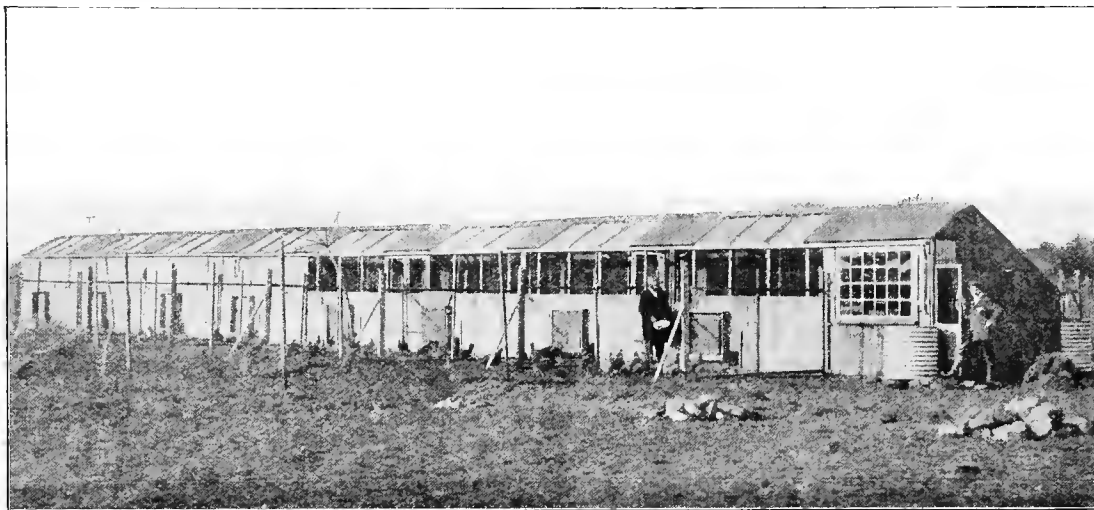


FIG. 10.—LEIGH NOOK SCRATCHING SHEDS—GENERAL VIEW.

probably produce more manure, whilst it will be concentrated upon a small piece of ground. That daily sweeping of the gravel, with removal of the droppings, will go far to reduce the danger is equally true. This means labour, and the returns will have to be increased to repay it. The cost runs to about £200 per acre for buildings and fencing, which is a serious item. A general view of a range of these houses and runs forms the frontispiece. Fig. 13 shows a useful form of single scratching-shed house.

In conclusion, lest our meaning has not been made clear, the points may be summarized thus: (1) Scratching shed, where the birds can be kept employed in wet or cold weather; (2) long narrow runs, the parts next the house and the scratching shed laid down in gravel; (3) renewal of the gravel every year; (4) daily sweeping of the gravel to remove as much of the manure as possible.

in so doing, as, by a simple contrivance, the hens can be confined in the laying house until liberated. When the hens desire to lay, they pass into the laying room by means of a small trap, on the inner side of which are bolt wires, so that they can get in, but not out again. They thus can go into the laying house, but cannot escape until liberated therefrom. Three or four times a day the attendants go round, count the number of eggs in the house, and then register according to the hens that are therein. Of course, under this system, each hen must be numbered by means of rings placed upon the legs, and in the houses it is necessary to use a columnar printed form, so that every egg may be credited to the hen producing it.

For the following description of a fine range of



FIG. 11.—LEIGH NOOK SCRATCHING SHEDS—PASSAGE WAY.

scratching sheds on a different plan, we are indebted to the owner, Mr. W. Reynolds, of Leigh Nook, Street, Somerset. These have been designed to accommodate

LEIGH NOOK SCRATCHING SHEDS.

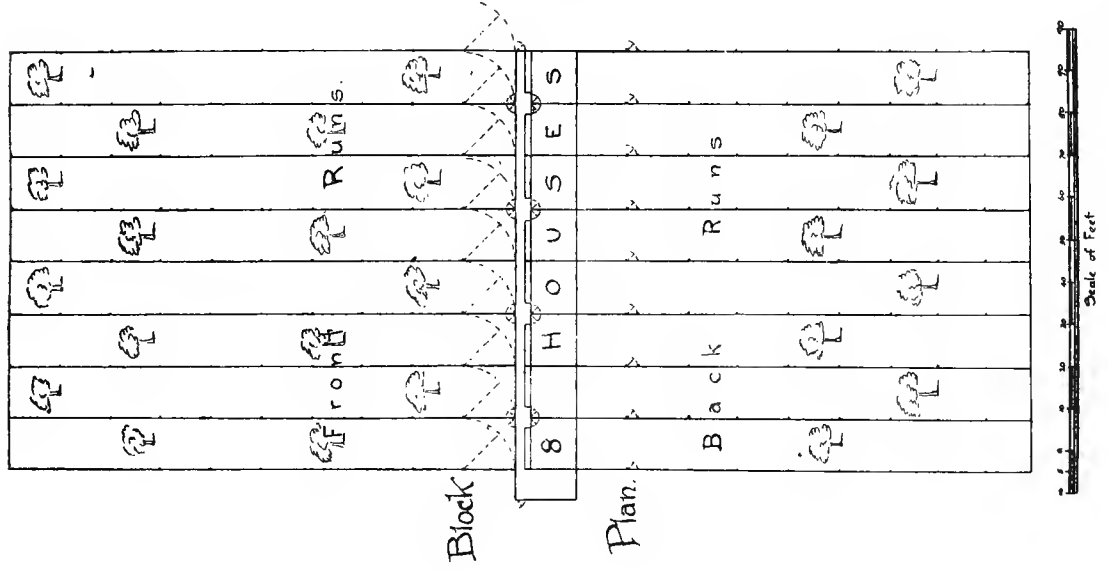
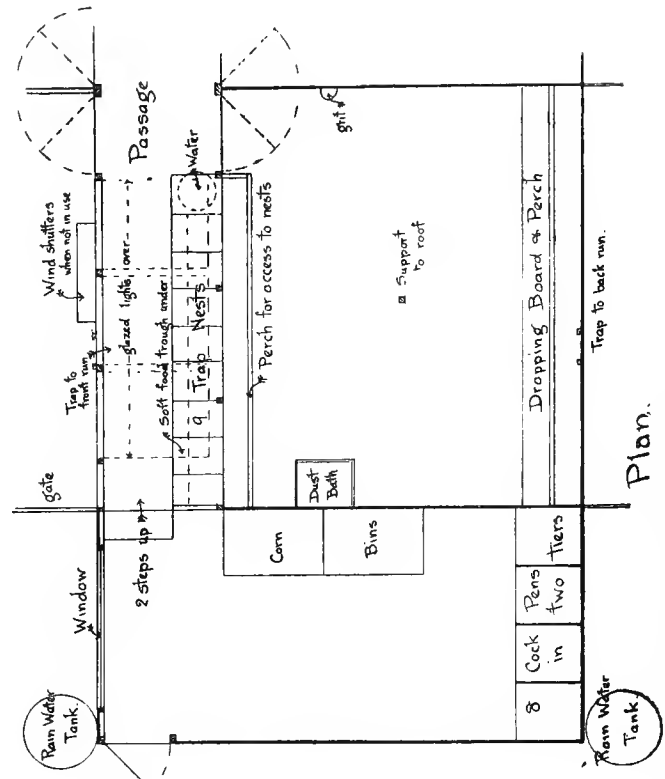
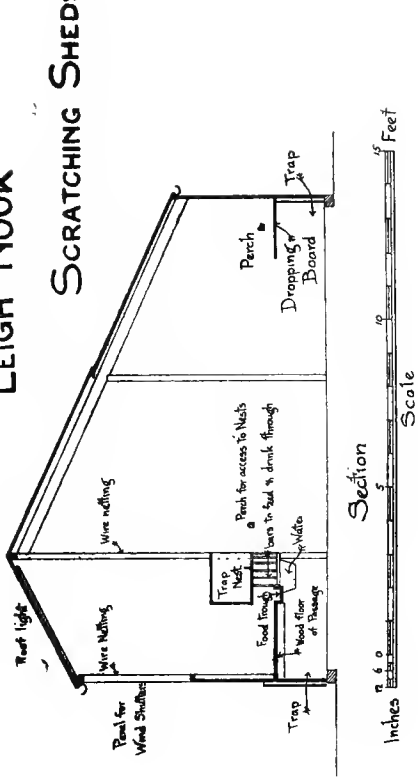


FIG. 12.—LEIGH NOOK SCRATCHING SHEDS—PLAN.

a flock of 200 pullets, with the double purpose of obtaining winter eggs and selecting by recording nests the best layers for the following breeding season. The idea was to lessen, as much as possible, the labour involved in attending thoroughly to such a large number. The range (Figs. 10, 11, and 12) consists of eight sheds, 14 feet 6 inches by 12 feet 6 inches (including the passage, the space underneath which is used by the fowls), with a food-store, etc., at one end. A raised passage, 18 inches above ground, runs the entire length, with doors on one side leading to each of the front runs and on the other to the sheds. Once in the passage, which has a door at either end, the soft food can be placed in the feeding troughs, the water-vessels cleaned and refilled, the recording nests examined, and the trap to either front or back runs opened or closed by cords without being hindered by a single door. In the house shown are nine trap-nests,

glazed lights fitted, which can be opened or altogether taken away. The houses benefit thus in winter from the sun, and in very hot weather they get the amplest ventilation. The rest of the roof, together with the back and two ends, are formed of tongued boarding covered with good roofing felt, thus making the houses draught-proof. It will be seen that each house has two runs, the front ones having two orchard trees in each, and at the back, where the houses afford some shade, there is only one. An experiment is being tried with raspberry-canec and gooseberry-bushes against the wire of runs to increase the shelter and prevent fighting if two pens with cocks have to be turned one way.

The first length (12 feet 6 inches) of fence in front is formed into a gate, and by opening all of these back on to the runs, even if in use, and closing the traps, all the birds are secure, and a cart or waggon can pass

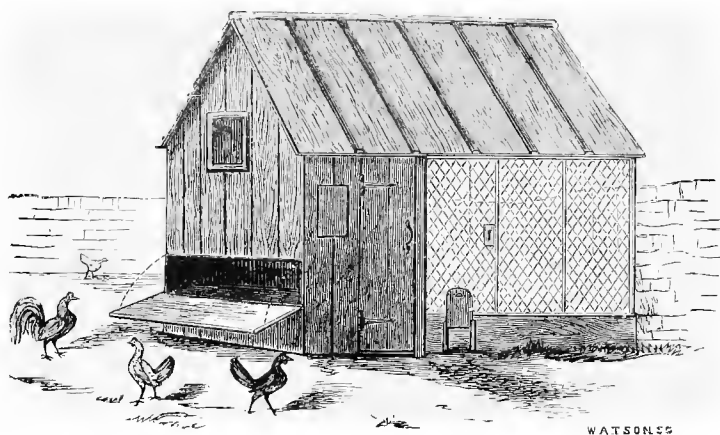


FIG. 13.—SINGLE SCRATCHING-SHED HOUSE.

but in four out of the eight houses there are only eight nests, a broody-coop taking the place of the missing one. The floor of the sheds is raised with road-earth 3 inches above the surrounding ground-level, and during the whole winter is kept liberally supplied with litter—*i.e.*, waste and broken straw, chaff, etc., from threshing machines. In very cold or wet weather the pullets are entirely confined to their houses, and two half-feeds of grain are fed amongst the litter. The night perch is at the back, with a dropping board beneath, which saves manure and makes cleaning easy. For vegetable food a cabbage is usually hung from the roof, or a mangel or other root provided. Dust-baths and grit-boxes also find a place.

The passage is divided from each shed, and from front runs by wire netting, and in very bad driving wet or cold weather, wind shutters, formed of canvas or battens, are filled in each panel of the front against the wire netting. Part of the front slope of roof has

along the front to deliver road-earth or litter, and to collect manure or tainted earth. The arrangement of the doors from passage to shed or run opposite each other has been a great help in this way. The ground on which these sheds stand slopes towards the food-store end, and eave-gutters carry the rain-water to tanks at either corner; this saves the ground from getting soaked, and lessens the labour of carrying water. The pens for cocks are provided for use in the breeding season, when two cocks are alternately run with each pen that is mated. From twenty-five to thirty pullets can be run in each shed according to breed.

These sheds were put on a temporary grass or green crop consisting largely of sainfoin. Probably it would have answered better to put on permanent pasture. The growth at first was rather checked, owing to allowing the fowls in summer and autumn to use the run in very bad weather, which was unusually

wet. But, as a proof that the grass is not spoilt, there is a better show of it in the old runs (the first four) than in the part not yet enclosed, and this has, except for the roadway, much improved the last year. The ground has now been drained, as it holds too much water for the apple-trees just planted, and this will also benefit the grass. It does not, however, show any signs of losing heart, and a crop of good hay was taken off all the runs half at a time last year. The total cost of a range of this size is £120 to £130.

Another form of house in which are two compartments is the Velmead (Fig. 14), suitable for smaller plants, and where buildings of a less permanent character are desired, or long runs cannot be employed. In this case both the roosting-house and covered shed are well lighted, and if built double can be fitted with runs of almost any shape. It is an excellent plan in all cases to gravel the run for 4 or 6 feet all around the house.

FENCING.

Where permanent houses of any form are employed it then becomes necessary to use fencing for the separa-

strength with the minimum of cost, as the smaller the mesh the greater the amount of wire employed and the cost of making. The height of fencing must be determined by the class of poultry to be enclosed. Heavy birds of the Asiatic type can be restrained by a 3 or 4 foot fence, whereas light, active breeds, such as the Hamburgh, Ancona, and, to a lesser extent, the Leghorn, can, if they wish, surmount 8 feet fencing

without difficulty. Our experience has been that, excepting with the Hamburgh and Ancona, provided that there is a good grass run and the birds are well employed, a fence 6 feet high is ample for practical purposes, and even with the lighter breeds just named, if netting is used to that extent, and the supporting

posts carried 1 foot higher, with a single strand of wire stretched all around the runs on tops of the posts, this will prevent their flying over. A 6-foot fence is generally suitable to the houses, and looks better than one either higher or lower.

In Fig. 15 is shown a form of fencing which is very ornamental, and very useful where the runs may have to be moved, but it is too expensive for the generality

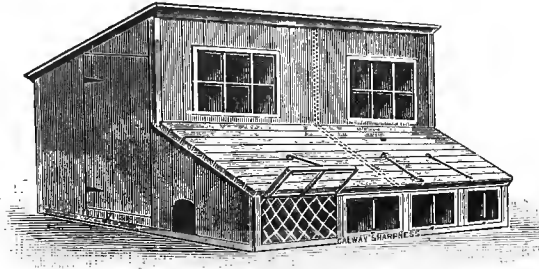


FIG. 14.—VELMEAD POULTRY-HOUSE.

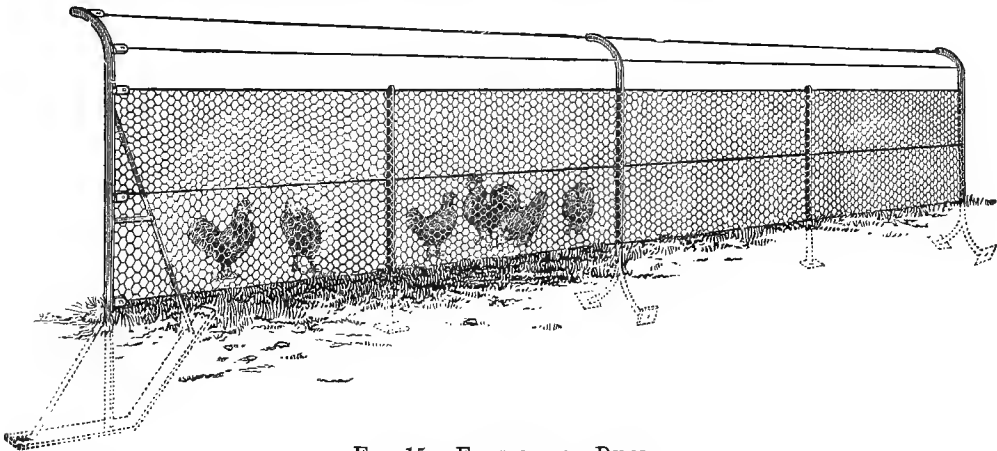


FIG. 15.—FENCING FOR RUNS.

tion of the runs, in order to keep the birds to their own location. For this purpose the cheapest and best material is wire netting, a good quality of which will last for years. It is made in rolls of fifty yards, and can be bought through the ordinary channels of trade at reasonable prices. Where young chickens are likely to be kept in these runs the mesh should not be larger than 1 inch, but for adult fowls the ordinary 2-inch mesh is to be preferred, and offers the maximum of

of poultry farmers. The better plan for fixed runs is to drive posts or fix poles, 3 inches in diameter, into the ground, and upon these fix the netting. For a 6-foot fence the posts should be 8 feet long and pointed. They will last much longer if well tarred before they are driven home. But before this is done gates should be fixed so as to facilitate work in management of the poultry. An extra gate or two leading from one run into another, and to the outside fields, will often save a

great amount of time. Hence it is desirable to think the question well out in advance. Where runs are arranged side by side, unless they are divided by solid partitions, the male birds will quarrel and often injure each other, as well as worry themselves by the sight of

the netting is drawn downwards by the side wire and fixed to the boards or corrugated iron, it will have the taut appearance desired. Where this plan is adopted, the posts may be 10 or 12 feet apart, or in accordance with the length of the sheets of corrugated iron, but if

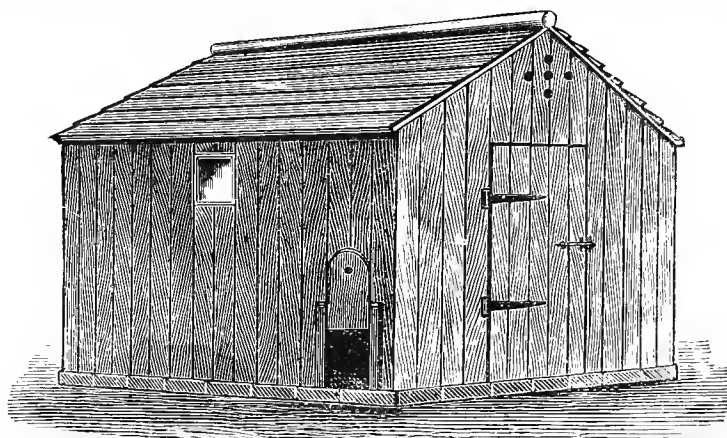


FIG. 16.—FIELD POULTRY-HOUSE.

their rivals. For this reason the bottom 2 feet of the fence should be closely boarded, or sheets of corrugated iron used to that depth. Not only is this useful for prevention of fighting, but it also affords shelter against wind, and adds to the comfort of the inmates, at the same time greatly strengthening the fence. Where the plan recommended is adopted, the netting need not be continued to the ground, but merely to the top of

entirely netted they would need to be not more than 6 or 8 feet from each other. Runs should be planted with fruit-trees or bushes, or creepers may be trained up the netting, to afford shelter to the inmates. Wood-

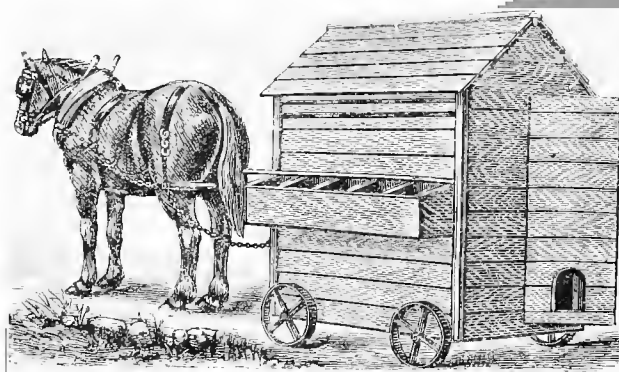


FIG. 17.—FARMER'S POULTRY-HOUSE.

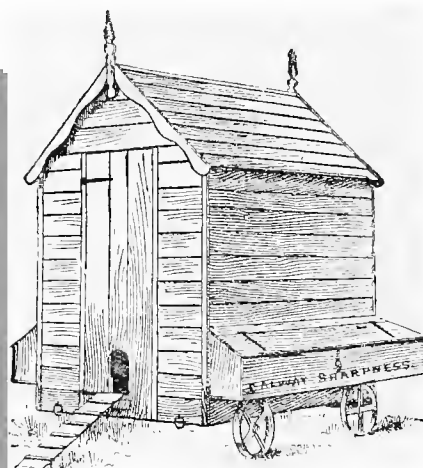


FIG. 18.—FARMER'S POULTRY-HOUSE.

the boarding or corrugated iron, overlapping a little to prevent gaps through which the birds might pass.

The appearance of wire netting is greatly improved when it is stretched tightly, and that is the difficult part of the work of erection. An excellent plan is to run a strand of wire along the tops of the posts, so that not only is the netting fixed by staples to the posts, but also fastened by tying wire to the strand. If

work used in runs, either as posts or gates or fencing, should be tarred annually to preserve it. It is desirable that gates should be hung well, and be wide enough to permit a barrow to pass through.

PORTABLE HOUSES.

Upon farms there can be no question that the best form is portable, as the houses can be moved about

from place to place as occasion requires, and made to fit in with the rotation of crops. Such houses can be placed out on grass or arable land according to the season of the year with great advantage to the farmer, as the fowls clean the land and enrich it by their manure. It has been found that by the adoption of the plan here advocated the cash gain is very considerable. Food which otherwise would be wasted is obtained by the fowls, and they can thus be fed much more cheaply than if kept on one place or in confinement, whilst the advantage in giving them fresh ground is very manifest. In Chapter XXII. we deal more fully with the manurial value of fowls in connection with agriculture. Upon our fields which are down for hay we do not remove the poultry until about ten weeks prior to cutting, finding that this avoids all danger of the grass becoming trodden, and the crop comes strong

grounds and in hop-gardens the benefit is even more apparent.

Where the house is not required to be moved more than once or twice in the year, the form shown in Fig. 16 can be adopted, as the labour of taking the erection down and re-erecting is small. For this purpose it is built in sections and bolted together. Under these conditions wheels are not required, and it is used without a floor. Upon grass land the plant in and immediately contiguous to the house would be injured, if not killed, and consequently this plan is to be preferred on arable farms. Where it is desired that the grass shall not be damaged, then the work of removal is greatly facilitated if wheels are fitted, so that labour is minimized. In this case the additional cost is speedily saved. Figs. 17 and 18 represent the ordinary form of poultry-house upon wheels, but these are fitted

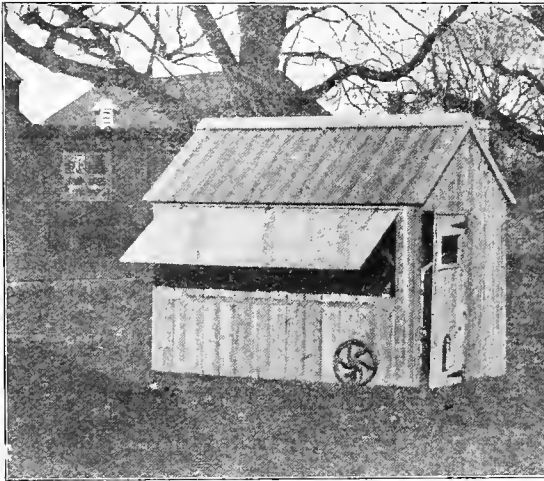


FIG. 19.—IDEAL POULTRY-HOUSE—
FRONT VIEW, LOWERED.

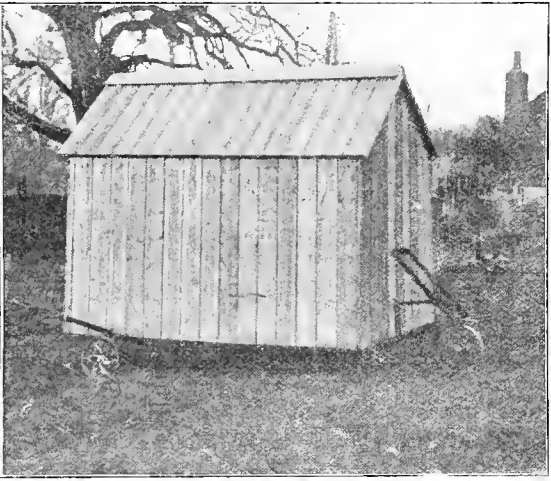


FIG. 20.—IDEAL POULTRY-HOUSE—
BACK VIEW, RAISED.

and in good condition. On arable farms they can be placed out before the plant appears, when it is well up, and after harvest. On dairy farms it is found that fowls do not interfere with the cattle, or the cattle with the fowls, and the maintenance of several hundred head of poultry need not necessitate the reduction in number of the cows on a large dairy farm. And on a farm largely devoted to grain and roots the houses are placed in corners of the fields where grain or roots are growing, and though for a yard or two around the ground is bared, that is all the damage which results. The birds wander in and out among the grain-stalks and growing roots without injuring them, and render service in other ways. It is commonly thought that fowls injure growing crops, but experience has proved that, after the plants are 6 inches above ground, there is no risk whatever in so doing, and that only good results from the adoption of this plan. On fruit

with a wooden floor, otherwise, as the walls are necessarily raised above the ground, there would be a strong draught passing below, and the inmates could be reached by their enemies. For reasons which have been fully explained in the previous chapter, it is much better that the ground should be the floor, not only by reason of the fact that a house will thus be warmer in winter, avoiding the bank of cold air which, when a raised floor is employed, passes under the house and reduces the temperature, and also it is cooler in summer; but, in addition, the labour of cleaning the house is avoided, and the manure falls directly upon the ground. If removal takes place two or three times per week, no injury to the grass results, and the manure is well distributed. With a view to avoid the use of wooden floors and to retain the mobility of poultry-houses, methods have been introduced of raising them upon their wheels for removal and of lowering

upon the walls when stationary. Figs. 19 and 20 show the latest form, designed by Mr. Will Brown, of the College Poultry Farm, Theale. In this three wheels are employed, and at one operation, by means of a powerful lever arm, the house can be raised or lowered. The house is provided with a shutter the entire length of one side, and insures plenty of fresh air to the inmates, but as the opening is netted behind, they cannot be attacked by enemies. Fig. 21 shows the Neaverson house upon two wheels, also raised at one operation, and in a small house very easily moved. Figs. 22 to 24 represent patent adjustable wheels for poultry-houses, invented by Mr. W. T. Chafer, of Doncaster. By a most ingenious method of lever weights, when the house is raised or lowered, catches fix or release the supporting bar. To move the house a man or boy lifts up the end about 8 inches; the wheels then drop and are automatically locked in position, holding the house clear off the

be turned in its own length. It, however, requires two operations for either action. There can be no question that the future of farm poultry-houses is involved in those which, whilst removable by means of wheels, minimize labour and insure the comfort of the inmates by having no floor. This is the form which we recommend for use in connection with agriculture. With all these houses it is easy to add a shelter for the birds in unfavourable weather, and, to facilitate removal, which is better if separate from the main building. The question of closing up at night is dealt with below.

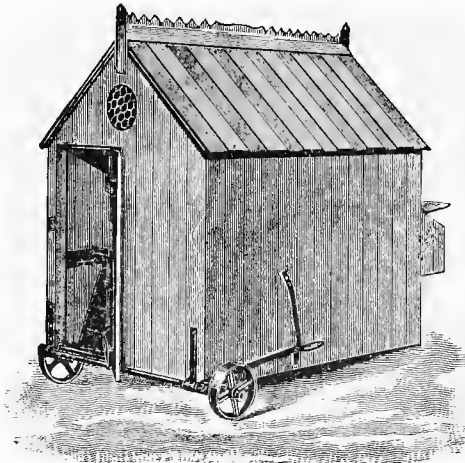
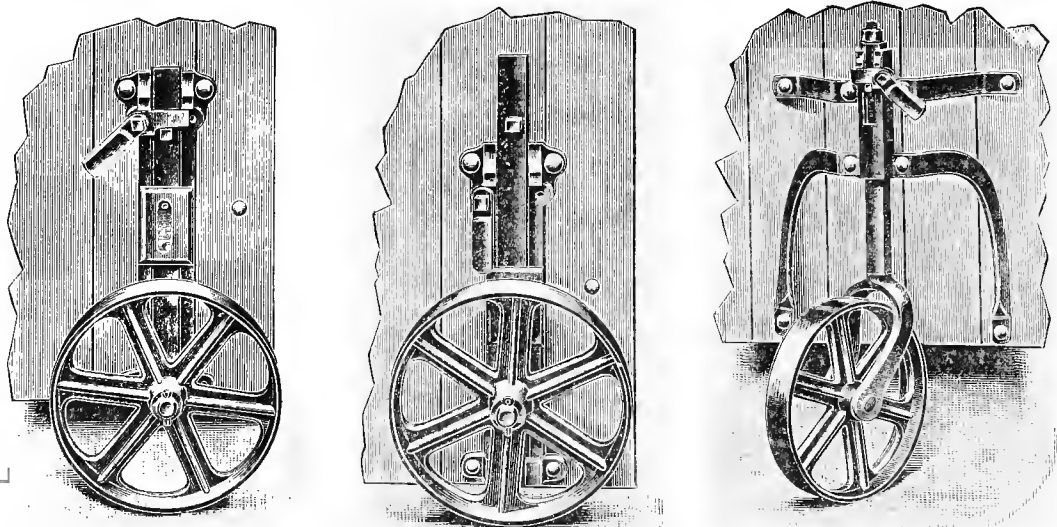


FIG. 21.—NEAVERSON'S HOUSE.

PROTECTION AGAINST FOXES.

Very strong complaints have been made from time to time as to the influence of fox preservation upon poultry-keeping, and there can be no question that in many districts fox-hunting has had a very deterrent influence in this direction. Farmers have not increased the number of their poultry to the same



FIGS. 22, 23, 24.—CHAFER'S PATENT ADJUSTABLE WHEELS (RAISED, LOWERED, AND FRONT SWIVEL).

ground. To lower the house it is again slightly raised, the locking bar swings clear, and the house drops flat on the ground. By this simple arrangement a floor is not necessary, thus saving all trouble of cleaning out. It is now fitted with a patent swivel front-wheel, and can

extent as elsewhere because of the serious losses which result. It may be stated that nearly all the hunts have funds, and that owners are compensated for the loss of their birds. Of course, how these funds are administered depends greatly upon the individuals having charge of

them. In some cases there is a liberal payment; in others the same term cannot be applied. But even a most liberal Master of the Hounds cannot hope to recompense poultry-keepers for the loss which they suffer. It is usual in most places to consider two shillings per bird a fair compensation. Those who go in for the better classes of poultry, however, know that such a payment is a very inadequate compensation for the loss of birds that might later on be sold for almost as many pounds. On the other hand, there is no doubt that hunt funds are constantly being imposed on. Claims are made for birds that have never been killed, and some people appear to think that it is their duty to obtain from the hunt funds a certain share of the money available in this way. Even allowing that every claim is just, the present system is certainly by no means satisfactory, for so long as two shillings per bird is regarded as the amount to be paid for compensation, farmers and others feel that it is useless keeping anything better than mongrels under such conditions. Hence the development of the higher qualities of birds is greatly retarded.

We have tried to state the case as fairly as possible, because in matters of this kind it is useless making extravagant statements, and we must recognise the real facts of the case. So far as this country is concerned, fox-hunting is a fact that we cannot alter, whatever our opinions may be, and it would be a very serious day if we could alter it. On the other hand, there is sometimes a tendency amongst those who ride to hounds to absolutely ignore the rights of other people. We cannot, therefore, form a fair opinion if we only look on the matter from one point of view; but with an equal desire on both sides to meet the necessities of the case, it ought to be possible, with that spirit of compromise which is so characteristic of the English race, to arrive at a satisfactory solution of the difficulty.

It is interesting to note that even in the hunting districts there has been a considerable development in poultry-keeping of late years. Recently we had an interview with a gentleman who lives in one of the great hunting shires, and he stated that in one village the number of poultry kept has increased ten-

fold during the last five years. But it was evident that the class of fowls so kept had not improved in anything like the same proportion. Farmers state that they do not go in for better breeds simply because, if the birds were killed by the foxes, they received such a small amount of compensation. This is a fact that we must meet in one way or another. It has taken many years to bring the bulk of land-owners to realize the importance of poultry-keeping, but we can claim that in many cases a desire is being manifested to find some means whereby they can conserve their sporting opportunities and at the same time avoid preventing what is a natural development. In fact, as a consequence of the changes which are taking place around us, it is absolutely essential that the landed interest shall realize the necessity of affording farmers and others the opportunity of making money in connection with these smaller branches of agriculture. When once this spirit has been manifested, a great many of our difficulties will disappear, and we venture to think that, as a result of the farmers themselves taking more interest in poultry-keeping, a solution will be arrived at more easily. So long as it was simply a means of pin-money for the women, we are afraid that many of the farmers did not give that sympathy and help which ought to have been readily

afforded. When, however, it becomes part of the recognised income of the farm, the necessities of the case are pressed home in a manner not thought of before.

The chief difficulty is found in connection with the movable houses, which are now becoming so common, and yet by a very simple arrangement this can be accomplished. Many farmers understand the necessity of shutting up their fowls at night, and yet at the same time there are certain difficulties in the way when they are widely scattered out, especially at the present time; for labour is by no means plentiful, and whatever increases labour should be avoided. Taking it practically, suppose that on a farm there are a dozen of the portable houses scattered somewhat widely about, someone has to go round to feed the birds an hour or two before sunset. They must either wait there until the birds have been fed, and then shut them up inside, if the ordinary form of house is employed, or

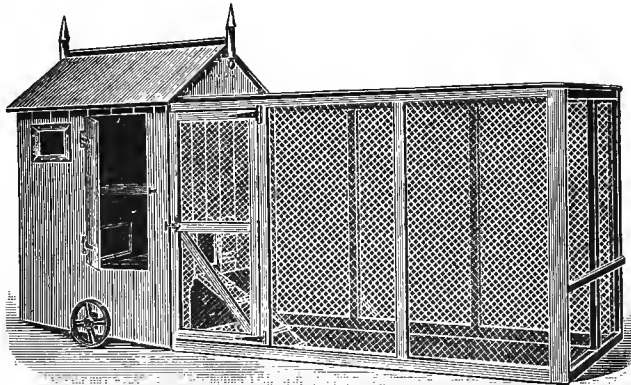


FIG. 25.—PORTABLE HOUSE WITH ATTACHED RUN.

must go round again, and it is undoubtedly the case that this involves considerable time. Moreover, in the morning the fowls are cooped up in their house, which is none too large, for hours after they would prefer to be outside. In order to liberate them—and every attendant knows very well that the birds are there eagerly crowding round the door in order to escape from their sleeping place—someone must go round in the morning. What should be done is to add to each house a small run, which can be simply made, is very inexpensive, and, at the same time, is quite firmly fixed, so that a fox or other marauder does not feel inclined to attempt attacking the birds. The run is better if built of a stout wooden framework, about 12 feet square and 30 to 36 inches in height. On the two sides, one end, and also the top, good wire netting should be fixed firmly; at the other end wire netting should also be fitted, except immediately in front of the house. If this run is placed against the front of the house and fastened with a catch at either side, it will be an effective protection. When the attendant goes round in the evening he should put the food inside the run, and the birds will immediately go in to feed; he then runs it along the ground until it is in the proper position, when, by fastening the catches, the whole thing is complete. The birds are in the open air, they are not too crowded, and can go into the house whenever they think fit. In the morning, as, of course, the trap-door is never closed, they can come out into the run and make themselves quite happy in the fresh air, which is the desire of every animal at that period of the day, and they will not have that sense of confinement met with when they are confined in the house. As soon as the attendant comes round he simply unfastens the catches, draws the framework away from the house a yard or two, and the birds are at absolute liberty. They can be so left during the whole of the day, repeating each evening as stated above. Of course, provision must be made that, in the case of houses with wooden floors, there shall not be a gap so that they can escape from the house, or any animal enter the house and run. This is very simply done by having a hinged board dropped down in front of the house. Such a run as described can be made by anyone who is handy with tools for seven or eight shillings, and can be carried by a couple of boys to any place to which the house is moved. Of course, it would be very easy to make the whole thing more elaborate—in fact, to fold up, if preferred; or the end away from the house can be made in the form of a door or gate, but this would simply add to the expense without any corresponding benefit. If the house has a raised floor, to provide shelter beneath, as we sometimes see, the difficulty with regard to animals getting underneath would, to a large extent, be avoided; but in this case it would be necessary either to make the run higher its entire length or to slope the part adjoining the house

upwards. As already stated, we are not very fond of raised floors, because houses in which they are used are generally colder than when the ground is the floor.

Protection could be afforded in another form by having at the side of each house a covered shed with wire netting on two or three sides, and the trap-door passing from the house into this shed. There are many advantages in a covered shed, because during unfavourable weather the birds are absolutely protected. This would entail a little more cost. We are not now discussing whether the additional expense would be more than compensated by the gain derived, for it is needless to consider this at the present time. Such an arrangement as here indicated would not be suitable for houses that are to be frequently moved, but is excellent for those which have only to be taken from one place to another now and again; the labour of moving a yard of this kind with a solid roof would be greater than the form previously described. Fig. 21 shows a portable house introduced by Mr. William Calway, of Gloucester, with run affixed, so that the whole house can be easily moved. It is well balanced upon a pair of wheels, and in ordinary weather can be removed by one man.

COTTAGERS' POULTRY-HOUSES.

As a rule, cottagers will prefer to adapt some out-house for their fowls, or erect a roosting place near to their dwelling. The observations already made apply equally here, and all we need add is a warning as to the danger of keeping too many fowls in a house, so often the mistake made by small poultry-keepers. Fig. 26 shows a house suitable for this class of poultry-keeper. A capital dwelling for half a dozen fowls can be made out of a sugar or other cask, which may be purchased for 2s. or 2s. 6d. In buying, it should be seen that the staves are all in good order, for if this be not the case the whole will be at fault. The bands, top and bottom, should also be examined. It must be properly cleaned out, and, if a sugar hogshead, it ought to be placed in the sun to dry, or, if it be winter, in a warm shed. Probably the drying will reveal some weak places. These, if not very large, should be covered with pieces of tin, and any interstices closed up with clay or putty. It is well worth a little extra trouble to have this properly done. The top must next be fitted on, part of it being formed into a door sufficiently large to allow of the barrel being cleaned out, and also a trap-door for the fowls. We have generally made the former by permanently fixing half of the top and hinging the lower half to it, the latter, of course, forming the door, which will be complete with a button, bolt, or padlock. If the trap is to be at this end of the house, it had better be in the door itself; but, if the barrel is to stand where both ends are accessible, the preferable plan is to put the trap in the bottom and make the nest next the

door. The inside should have a good coating of lime, in which some carbolic acid has been mixed, and the outside be tarred. When perfectly dry it should be placed on bricks or blocks of wood, so as to raise it a few inches above the ground.

house into two portions, and use these alternately for, say, three or six months, planting each plot as vacated with quick-growing vegetables or roots, breaking up the land thoroughly and cropping heavily. Wherever possible, for birds in strict confinement, a covered

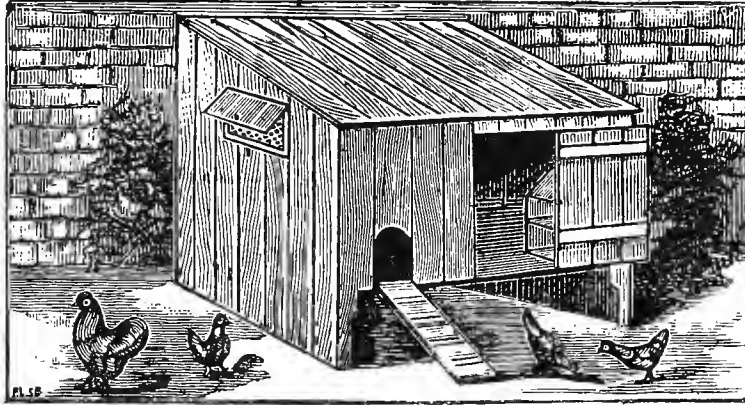


FIG. 26.—COTTAGER'S LEAN-TO POULTRY-HOUSE.

Where cottagers can allow their fowls liberty to wander on the roadside or adjoining fields, they can attain considerable success. When they are compelled to restrain the birds within limited areas, it is necessary to take precautions to avoid disease due to tainted soil. The best plan is to divide the ground available for each

shelter should be provided, in which the birds may be given employment as described in association with the scratching-shed system.

Chicken-houses are described in Chapters XII, and XIII., and those for ducks, geese, and turkeys in Chapters XVII., XVIII., and XIX. respectively.

CHAPTER IX.

FORMATION OF THE EGG AND CHICKEN.

WHAT IS AN EGG?—MALE BIRD NOT NECESSARY FOR EGG PRODUCTION—SHAPE OF EGG SHELL—MEMBRANES—ALBUMEN, OR WHITE OF EGG—YOLK—PROCESS OF PRODUCTION—SIZE OF EGGS—FORMATION OF THE CHICKEN—ELEMENTS NECESSARY—INFERTILE EGGS—PROCESS OF DEVELOPMENT—FUNCTIONS OF THE YOLK-BAG—EXIT OF THE CHICKEN.



ANY of the most familiar things around us we are most ignorant of, and it will doubtless be interesting to readers to know the process of formation of an egg, for, although this is one of the commonest articles of food, yet there is a great want of knowledge as to its composition and formation. It has been well described as "a mass which forms in the ovaries and oviducts of a large number of animals, and which in a common envelope encloses the germ of the future animal, with the liquids destined to nourish it during a certain lapse of time, when the vital impulse has been communicated to it by fecundation and incubation." This is true so far as fertile eggs are concerned; but though the object of the egg is undoubtedly to envelop the germ, yet impregnation of an egg by this germ has no influence upon the actual laying thereof, and a hen will lay at the proper season independently altogether of her being mated with a male bird. Millions of eggs are laid every year which would never hatch, simply because they contain no germ, not having been fecundated.

It is a very common idea, but an erroneous one, that in order to keep hens laying they must have a cock bird running with them. That such is altogether wrong is easily proved in practice, as there are many who keep fowls without a male bird, and yet have an abundant supply of eggs. This is, of course, different from the case of most animals, for, as a rule, impregnation is the incentive to reproduction; but it must be remembered that an egg with a germ only represents the first stage, and its voidance does not, as in the birth of animals, mean actual appearance of the living being itself. There is consequently a further process for its completion.

HOW AN EGG IS FORMED.

The form of an egg is well known (Fig. 27), with its two diameters, one of its length and one of its breadth,

a small end and a large one. Eggs vary in weight according to the breed and age of the hens, but eight to the pound, or 2 ounces each, is regarded as a fair size. The outer envelope or shell is white or coloured according to the species, and is composed of carbonate of lime, phosphate of lime, and animal gluten. Salts of lime give the shell its hardness, and cause the particles to adhere. Soft eggs are those that have no shell, or which have too thin a shell, and are deficient in salts of lime. Hence the necessity for introducing lime into the food of the fowls. It is surprising where a hen finds all the carbonate of lime necessary, for if she lays 100 ordinary sized eggs in the year, she will have produced about 22 ounces of pure carbonate of lime. Thus, as Mr. P. I. Simmonds, F.L.S.,* observes, if a farmer has a flock of 100 hens, they produce in eggshells about 137 pounds of chalk annually; and yet not a pound of the substance, or perhaps not even an ounce, may be found on the farm. The materials for the manufacture are found in the food consumed, and in sand, pebbles, brick-dust, pieces of bone, etc., which hens and other birds are continually picking from the earth. Their instinct is keen for these apparently innutritious and refractory substances, and they are devoured with as eager a relish as the cereal grains or insects. If hens are confined to barns or out-buildings, it is obvious that the egg-producing machinery cannot be kept long in action, unless materials for the shell are supplied in ample abundance. If fowls are confined in a room, and fed with any of the cereal grains, excluding all sand, dust, or earthy matter, they will go on for a time and lay eggs, each one having a perfect shell, made up of the same calcareous elements. Vauquelin, the distinguished chemist, confined a hen for ten days, and fed her exclusively upon oats, of which she consumed 7,474 grains in weight. During this time four eggs were laid,

* *Journal of the Society of Arts*, December 9, 1887.

the shells of which weighed nearly 409 grains. Of this amount, 276 grains were carbonate of lime, $17\frac{1}{2}$ phosphate of lime, and 10 gluten. Of course, it is more than likely that there was some amount of reserve stock of shell-forming substances in the body ere the hen was shut up, and that if the experiment had been continued longer shell-less eggs would have been laid. Still, it is a fact that there is only a little carbonate of lime in oats.

The shell is porous, or permeable by the air, without which the chick could not live during the process of incubation. The white, fragile, outer envelope is composed of mineral matter, but is not the light, compact covering its appearance would indicate, for it is completely perforated with a multitude of minute holes or pores. When examined by the microscope the shell has a sieve-like appearance, very much resembling the white perforated paper sold by stationers. By means of these holes there is a constant evaporation going on from the time it is laid until it is consumed. This evaporation depends upon the conditions under which the egg is kept, and will vary in accordance with these conditions, being much more rapid in hot weather than in cold, and in warm places than in cool. It is for this reason that eggs are not so easily kept in summer as in winter. If by any means this evaporating process can be stopped, and no other influence of an antagonistic nature be brought into play, the egg remains sound and good

for a great length of time. The substances used to close the pores of the egg must not be soluble in watery fluids, or liable to be readily removed. By means of chemical agencies the holes on the shells of eggs can be closed or filled with lime placed in contact in solution, and the contents preserved sweet and good for months.* With this question we shall deal later on.

Within the shell are two membranes or skins, the outer one of which adheres to the shell, and the inner one slightly to the outer. But towards the large end of the egg the two are separate, and this forms the air chamber. The white of the egg partly consists of

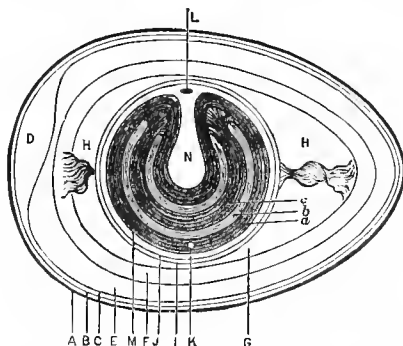
albumen, and is a transparent liquid, free from smell when the egg is fresh, and tasteless. The albumen coagulates on the application of heat at 140° , and is insoluble in water. Chemical analysis has demonstrated that it is composed of carbon, oxygen, hydrogen, azote, phosphorus, and sulphur in various proportions. A part of the oxygen and hydrogen evaporates during incubation, or when the egg gets stale. In the white there are three distinct and separate layers of albumen: the outer (a liquid), the second in which chalazæ terminate, and an inner layer. The chalazæ are two twisted cords of a more dense albuminous character, which have their origin in the outer albuminous membrane, and take the form of a spiral cord in the direction of the longer axis of the egg. They are well known to all eaters of eggs, and are the portions which cooks

take out when beating an egg. They form a ligament by means of which the yolk remains suspended in the midst of the albumen, with the germ floating upwards, and encircled by the thin membrane known as a membrane of chalazæ.

The yolk is the principal part of the egg, and is separated from the white by a very thin enveloping membrane, called the vitelline membrane, and is slightly lighter than the white, filling the upper part of an egg when it is lying on its side. It is the yolk which ultimately furnishes nourishment for the embryo, and its composition is richer than that of the white. It comprises a

layer of white yolk which does not harden even in cooking, and within this are concentric layers of yellow and white, which curve round the utricule, the interior part of which contains the germinative vesicle. When the egg is perfect the vesicle touches the vitelline membrane, at the upper part of which is found the germ, known from its yellowish-white colour.

The yolk is composed of albuminous matters, of organic salts, of vitelline, of colouring matters (a red and a yellow), of phosphoric acid, and of a fatty phosphoric substance of itself sufficient to support the chick during its earlier stages.



SECTION OF AN EGG.—A, the shell; B, membrane adhering to the shell; C, second membrane, slightly attached to B, except at large end of egg, where they separate and form D, the air space; E, the white or albuminous part of the egg (first layer liquid); F, the white of the egg (second layer semi-liquid); G, the inner white; H H, chalazæ; I, outer membrane; J, very fine vitelline membrane; K, the outer part of yolk; L, germ; M, yolk; N, utricule; a b c, separate layers composing the yolk.

FIG. 27.—FORMATION OF THE EGG.

* *Journal of the Society of Arts*, December 9, 1887.

PROCESS OF PRODUCTION.

The process of production of an egg is a most interesting one. The ovum, or yolk, which, as we have already seen, contains the germ in a fertile egg, is generated in the ovary, and so soon as it ripens there is a rupture of the ligament by which it is attached to the ovary. Then, passing down the oviduct, it is first impregnated, coated with layers of albumen, has the chalazæ placed in their proper position, and finally receives the skins and outer shell. As may be easily imagined, this delicate organization is very easily thrown out of gear, more by over-feeding than anything else.

Eggs are produced from what may be termed surplus food, by which we mean such food as is not absolutely required for sustenance of the bird, and if food be given in excess or of too stimulating a nature, the result is, in the one case, that the organs are clogged up with fat, and the egg-laying machinery stopped, or, in the other, that the ova are produced too rapidly. In the ordinary course of things only one ovum should be generated in twenty-four hours, and the fowl ought not to lay more than five or six times a week. If two ova are produced in one day many eccentricities are the result, which puzzle the poultry-keeper. Sometimes the two ova pass into the oviduct together, and then a double-yolked egg is formed. If this egg is set and the yolks have been fertilized, then come some of those freaks of Nature which are communicated as great wonders. Occasionally two perfect chickens are developed and hatched out of one shell, but as a rule only one ovum comes to maturity, and thus we get four-legged or two-headed monstrosities. Another result of over-feeding is the production of one perfect egg within another. This is caused by an irritation of the oviduct, which, contracting in front of the perfectly-formed egg, instead of behind it, forces it back until it meets another yolk, when the two join company, and, again being coated with the white and the shell, produce the wonder spoken of. Soft eggs result from over-fattening food and too little exercise, the ovum passing down the oviduct too rapidly for the secretions to be properly made, or, on the other hand, they may be caused by absolute want of lime, without which, as we have already seen, the shell cannot be properly made. None of these irregularities are found in wild birds, and these must be regarded as a penalty of domestication. But knowing what dangers to avoid, it is then not very difficult to so feed and manage the birds that their organs may work in their proper and natural order. Birds when wild lay very few eggs, and it is only by the handiwork of man that they have been brought to their present productiveness; but it has been gradually done, and with no apparent injury to them. It must, however, be borne in mind that overstepping the boundary soon brings its own punishment, and therefore great care

needs to be taken in the feeding of poultry so as to maintain them in full health and vigour.

As will have been seen by the tables already given, there is a great variation in size of eggs laid by different breeds. Nor is this variation relative to the size of body, for many of the largest varieties produce comparatively small eggs, and *vice versa*. Speaking generally, there is little doubt but that on the whole the size of eggs, and the fecundity of our domestic fowls, has greatly increased within the last forty years. Some varieties may have suffered in both respects, due to close breeding and attention to mere external qualities; but we have many other breeds that have more than taken their places. It may here be mentioned that every egg, whether fertile or not, contains the female germ, but this cannot develop until it is impregnated with the male element. The latter is contained in a cell near the upper end of the oviduct, where is usually a sufficient supply for several eggs, so that a separate impregnation for each egg is not required, as commonly supposed. When fertilized, and whilst passing down the oviduct, the process of incubation really commences, doubtless due to the bodily heat of the hen, and this development is known under the name of segmentation, the single cell partially dividing.

FORMATION OF THE CHICKEN.

The small speck to which reference has already been made contains the embryo chick, and it is one of Nature's great mysteries how this, when subjected to heat and moisture, gradually develops until the fully-formed bird is produced. All the efforts of our great scientists have been baffled in their attempts to discover the secret of generation, and to-day we know little more of this mystery than has ever been known before. We may understand a little better the workings of Nature, and that by observing certain conditions we may expect defined results, but how life is imparted is beyond our ken.

The conditions necessary to the development of a germ are chiefly heat and moisture. Given the presence of embryo within a shell, if proper heat and a sufficiency of moisture are provided, with daily cooling and turning of the egg, these gradually cause development, which results in the appearance of a chicken at the end of twenty-one days. In order that the germ may receive heat, there is a most delicate and beautiful arrangement by which it floats ever to the top. This is secured by the chalazæ, which not only keep the yolk in its place, but weigh down the lower side of it, and however the egg is turned the germ floats at the top. It is for this reason that in working an incubator regular turning of eggs is insisted upon so strongly. When a hen is employed she does the work herself, but if it is not done there is danger that the heat will cause yolk and white to adhere, and as a consequence the embryo dies.

Very many addled eggs are so caused by want of being properly turned.

As soon as the fertile egg is subjected to proper conditions, the germ therein at once begins to expand, and within twenty-four hours has very sensibly enlarged. The heat necessary to secure this is between 102 and 106 degrees. Less than the former is not sufficient to bring the germ to maturity, though 100 degrees would start it, and over 106 degrees is most likely, if maintained for several hours, to kill it. Generally we have found that the best plan is to keep the heat as near 103 degrees as possible. That will permit of a little variation without danger, and yet be sufficient to effectually mature the chick.

FERTILE AND INFERTILE EGGS.

A few words here as to infertile eggs will not be out of place to emphasize what has already been stated. By the term "infertile" is meant an egg that has never been impregnated, and consequently one that cannot possibly hatch, for it does not contain an active germ, and without this no amount of heat can develop a chick. The germ must be communicated ere the egg is formed, and must be impregnated, and the egg is meant to be its protecting envelope. The effect of heat upon an egg is to dry up the contents and reduce them to a smaller compass. An infertile egg does not as a rule go rotten, a fact not generally known. Without death there can be no decay, and there cannot be death unless there has been life. Absence of a fertilizing germ means that the contents of the egg are inert and will not become rotten. The only exception to this is when an egg is produced by a diseased hen. On the contrary, when there has been life, but this life has died, all the elements of decay are within the shell, and that which would have been its strength becomes its weakness. The dead embryo—or, if the chick has been more or less formed, the dead chick—begins to decay, and soon the whole contents are a mass of corruption. This fact needs explanation, as many persons have erroneous ideas thereon. We have known purchasers of eggs say, in a tone which indicated that they thought they had been cheated, that the eggs were actually rotten, whereas this fact showed that the vendor had sent eggs which were at all events fertile. Eggs may die at any stage of incubation, but our experience has been that there is most danger between the third and fifth days in the first stage, and between the twelfth and sixteenth days in the second stage.

POSITION OF THE GERM VESICLE.

It is here to be noted that when an egg is properly formed, the germ vesicle always remains on the upper side of the yolk, and at the mouth of the utericle. The reason for this is probably that it may more easily receive the heat necessary to its development. Turn an egg as we like, the germ will be on the upper side.

This fact teaches us, as does the natural method of incubation, that the heat should be applied from above, not below. If the heat has to pass through the yolk as well as white, it will lose some of its power, and at the same time affect adversely the yolk.

INFLUENCE OF THE YOLK.

We must bear in mind the purpose for which an egg's yolk is intended, namely, to feed the chick during the period of its development. Or, as Marshall says "The embryonic portion is formed from the part of the egg comparatively free from food-yolk, and becomes converted directly into the embryo, while the vitelline portion or yolk-sac, which contains the bulk of the food-yolk, does not give rise directly to any part of the embryo, but forms a store of nutriment at the expense of which the development of the embryo is effected. At first the embryonic portion is very much smaller than the vitelline portion or yolk-sac, but, inasmuch as the embryo grows by absorption of the food-yolk, the yolk-sac diminishes as the embryo increases in size. A time comes when the two are about equal in bulk, and in the later days of incubation the yolk-sac is much smaller than the embryo. By the twenty-first day of incubation the yolk-sac is almost completely absorbed."*

When a fertile egg has been laid, it will be found that the result of what is called segmentation, really a commencement of formation of the embryo due to the heat of the hen's body, has been to form a minute cap over the germ vesicle, on the under side of which is a number of cells. These have no form indicative of their later use, but are very distinct, and under the microscope show various characters. So soon as sufficient heat is applied, the process, suspended in the meantime, resumes its operations.

FIRST DAY OF DEVELOPMENT.

During the first twenty-four hours the embryo develops those parts which afterwards become some of the leading organs of the body, notably the head, the vitelline vein, and neural fold and groove. But at this period it is not easy to distinguish between the embryo itself and the surrounding part, known as the area pellucida. Thus early in the period is formed the amnion, which may detain us briefly. This is a peculiar membrane enveloping the embryo, and forms a cavity in which this lies. It is made in folds, and "when the several folds meet and coalesce above the embryo they unite in such a way that all their inner limbs go to form a continuous inner membrane or sac, and all their outer limbs go to form a similarly continuous outer membrane or sac. The inner membrane thus built up forms a completely closed sac round the body of the embryo, and is called the amniotic sac, or

* "Vertebrate Embryology," by A. Milnes Marshall, M.D., D.Sc., etc.; London, 1893.

amnion proper, and the fluid which it afterwards contains is called the amniotic fluid, or *liquor amnii*. . . . The outer sac over the embryo lies close under the vitelline membrane, while its periphery is gradually extended over the yolk as the somatopleuric investment of the yolk-sac. It constitutes the false amnion, while the membrane of which it forms a part is frequently known as the *serous membrane*"* (Figs. 28 and 29).

SECOND DAY.

During the second day the sections of the embryo begin to take a more definite form, and various organs commence to assume something of their ultimate shape. The head now becomes more prominent, and grows more rapidly than the remainder of the body, for during the earlier stages there is no relation in size between head and rest of the body, as will be the case later on and after hatching. It may be mentioned that the embryo is firmer and more definite in type than was the case earlier on. It must be explained that up to this point the head is straight, and it is not until later that it assumes the shape afterwards maintained.

It may be stated that between the twenty-fourth and twenty-third hours the front end of the neural canal dilates into a small bulb, whose cavity remains continuous with the rest of the canal. This bulb is known as the first cerebral vesicle, and makes its appearance in the early hours of the second day. From its sides the two optic vesicles grow out. Behind the first cerebral vesicle two others make their appearance very shortly after the first, and still further back two shallow pits are to be seen, the auditory pits constituting the initial stages of the organ of hearing.

The heart is at the first really formed within the head-fold, where the throat will afterwards be found, though that organ has not yet appeared. The heart soon begins to beat, at first slowly and infrequently, but soon assuming more frequent pulsations. Connected with it are the veins, which will be more fully dealt with when we describe the vascular system, but it may be mentioned that during the latter half of the second day the blood begins to flow.

With further reference to the head and brain, Balfour states that "at the beginning of this (second) day the front end of the medullary canal was dilated into a bulb, the first cerebral vesicle, which by budding off two lateral vesicles became converted into three vesicles: a median one connected by short hollow stalks into a lateral one on either side. The lateral vesicles, known as the optic vesicles, have become converted into parts of the eyes; the median one still retains the name of the first cerebral vesicle." On examination, wrinkles are discerned in the head which "vary a good deal in appearance, and shift from time to time, but eventually, before the close of the

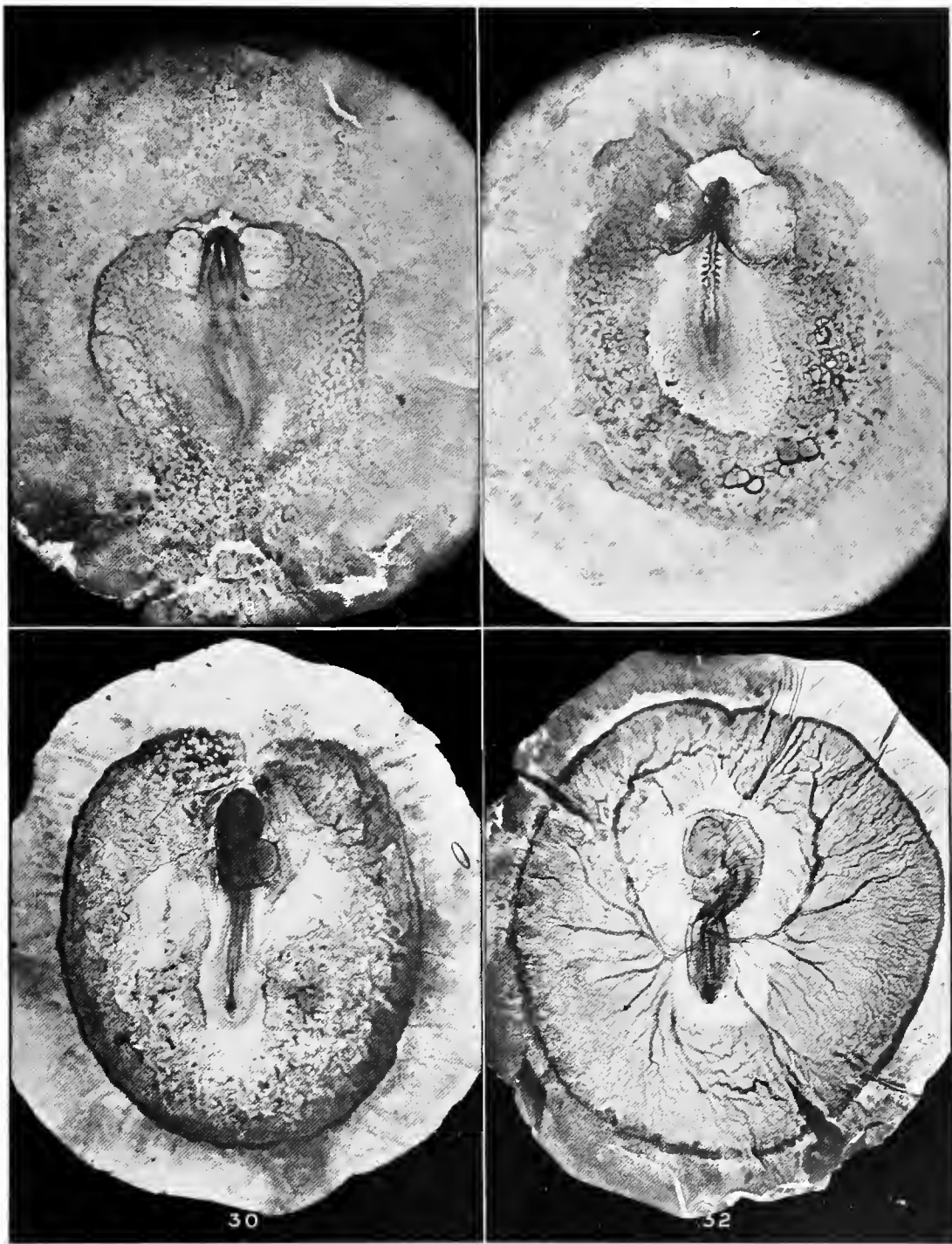
second day, after the formation of the optical vesicles, settle down into two constrictions, one separating the first cerebral vesicle from that part of the medullary canal which is immediately behind it, and the other separating this second portion from the third. So that instead of there being one cerebral vesicle only, as at the commencement of the second day, there is now, in addition to the optic vesicles, a series of three, one behind the other; a second and third cerebral vesicle have been added to the first." Towards the end of the second day the fore-brain, with its optic and cerebral vesicles, becomes slightly bent downwards, so as to form a rounded obtuse angle with the rest of the embryo. This is the head-fold, about which more will have to be said.

During the second day of a chick's development is found the first trace of the allantois, a temporary arrangement effecting most important functions during the period the embryo is within the shell, and assuming a more prominent form during the third day. It is part of the alimentary tract with which it opens immediately in front of the gut, which tract is formed by the primitive streak already referred to. "At first it is enclosed within the hind-gut, but on the fourth day begins to pass out beyond the body of the chick, and eventually spreads out over the whole body. On the first half of the fourth day the vesicle is still very small, and its growth is not very rapid. Its mesoblast wall still remains very thick. In the latter half of the day its growth becomes very rapid, and it forms a very conspicuous object in a chick of that date. At the same time its bloodvessels become important. It receives its supply of blood from two branches of the aorta, known as the allantoic arteries, and the blood is brought back from it by two allantoic veins, which run along in the body walls, and, after uniting into a single trunk, fall into the vitelline vein close behind the liver" (Balfour). By the ninth day the allantois has grown enormously, and has spread over the back of the embryo, and quite halfway round the interior of the egg-shell. It lies close to the shell, and is the medium through which the respiration of the embryo is effected. On the twentieth day the allantois dries and shrivels up, and as the chick steps into the outer world it is cast off (Fig. 30).

THIRD DAY.

It is usually recognised that the third day is the most important of all, in that so many of the new organs now begin to make their appearance. "On opening an egg on the third day the first thing which attracts notice is the diminution of the white of the egg. This seems to be one of the consequences of the functional activity of the newly-established vascular area, whose bloodvessels are engaged either in directly absorbing the white, or, as is more probable, in absorbing the yolk, which is in turn replenished at the ex-

* "Elements of Embryology," by Foster and Balfour; London, 1893



[Photo, C. E. Hearson.

EMBRYONIC DEVELOPMENT OF THE CHICKEN.

FIG. 28.—Embryo Chick, 18 hours.

FIG. 30.—Embryo Chick, 40 hours.

FIG. 29.—Embryo Chick, 24 hours.

FIG. 32.—Embryo Chick, 72 hours.

pense of the white. The absorption, once begun, goes on so actively that by the end of the day the decrease of the white is very striking" (Balfour).

It will be remembered that during the second day of development we saw a commencement of the head-fold, and this change proceeds rapidly during the third day, by the end of which it is entirely folded over, the optic vesicles coming to the centre, as shown in Fig. 31, drawn from a series of excellent photographs from Nature, taken by Mr. Charles Hearson, of Regent Street, London, to whom I am indebted for this and others. At first they are comparatively small, but steadily increase in size, finally assuming the prominence and position to be retained during life. The shape assumed by the head has to be modified, for the brain-pan has yet to be filled, the beak and mouth to be formed, although the nostrils and ears are well established. The head is really the first part of the body to assume its shape, and in the earlier stages is disproportionately large, as compared with the rest of the body. The formation of the eye is one of those wonderful processes so prevalent in natural operations, in which the needs of the future animal are provided for by a multitude of marvellous growths and evolutions. To attempt a description of these would involve more space than can possibly be afforded.

The nostrils or organ of smell is found to appear during the third day, at first being two depressions in the under surface of the head, immediately in front of the eyes. During the same period we find the alimentary canal forming with great rapidity, and this is to some extent connected with the tail-fold, in itself very similar to the head-fold, so far as the method of formation is concerned. Thus, we have the initial stages of the digestive system. And also lungs, liver, and kidneys are found to grow, even though at first very diminutive. All this time, in fact from an early period, the nerves are exerting a very important influence in the bird's structure.

FOURTH DAY.

Coming to the fourth day, and especially the latter portion of it, we find that there has been very rapid progress, an increase of size in the embryo being very

manifest. At the same time the white of the egg has diminished still more, and the embryo is lying almost in immediate contact with the shell. The vascular area by this time is nearly an inch in diameter, and there is a great increase in the quantity of blood circulating through the vascular area. It is not necessary that we should say more respecting the head, other than to indicate that the various parts are quickly assuming a definite form. But the most striking feature to be noted is the growth of the body proper, from which the limbs begin to spring on the fourth day, though they can be very slightly traced towards the end of the third day. At first they are simply conical buds projecting outwards, covered with a sort of cap. The front-limbs are longer and narrower than the hind-limbs, which are comparatively short and broad. The vertebral column is now taking more definite form, but not until the fifth day do we find it anything like complete. And towards the end of this day is formed in

the embryos of both sexes a duct, which in the female forms the oviduct, but is not needed in the male, and consequently disappears.

It is generally conceded that during the fourth day the generative organs also begin to appear, but as yet they are very indistinct, and not until a later period can their distinctive features be determined. Upon this point there is comparatively little real information. Apparently at first they are identical, and at this period are termed primordial ovum, the first traces of the male organ

being discernible about the sixth day. What are the influences towards the determination of sex do not yet enter within the range of exact science, and, being speculative, are outside our present purpose.

FIFTH AND LATER DAYS.

By the fifth day "the limbs have increased, especially in length; in each a distinction is now apparent between the more cylindrical stalk and the flattened terminal expansion: and the cartilaginous precursors of the several bones have already become visible. The fore and hind limbs are still exceedingly alike, and in both the stalk is already beginning to be bent about the middle to form the elbow and knee respectively. The angles of both knee and elbow are in the first

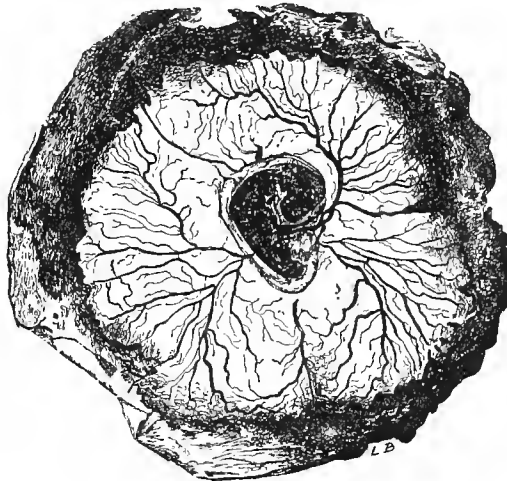


FIG. 31.—EMBRYO (THIRD DAY).

instance alike directed outwards and somewhat backwards. By the eighth day, however, the elbow has come directly backwards and the knee forwards. In consequence of this change the digits of the fore-limb point directly forwards, those of the hind-limb directly backwards. This state of things is altered by a subsequent rotation of the hand and foot on the arm and leg, so that by the tenth day the toes are directed straight forwards, and the digits of the wing backwards and somewhat ventralwards, the elbow and knee almost touching each other. . . . By the tenth day the fore and hind extremities, save for the absence of feathers and nails, are already veritable wings and feet" (Balfour).

The development of the chicken from the sixth day to its appearance from the shell does not require so much description, as it is to a large extent but growth to proper size of the various organs. There are, however, various features which are of very great interest and deserve our study.

One of the proofs of the evolutionary theory is that embryos are so much alike in the earlier stages. Striking and numerous as are the features which render the class Aves one of the most easily recognisable in the whole animal kingdom, the embryo of a bird does not materially differ from that of a reptile or a mammal, even in the points of structure which are most distinctly avian. It may, it is true, be possible to infer, even at a comparatively early stage, from some subsidiary tokens, whether any given embryo belongs to this class or that (and, indeed, the same inference may be drawn from the ovum itself), but up to a certain date it is impossible to point out in the embryo of a fowl the presence of features which may be taken as broadly characteristic of an avian organization. This absence of any distinctive avian differentiation lasts in the chick, roughly speaking, till the commencement of the sixth day. We do not mean that on the sixth day all the organs suddenly commence to exhibit peculiarities which mark them as avian.

There are no strongly-marked breaks in the history of development; its course is perfectly gradual, and one stage passes continuously into the next. The sixth and seventh days, however, mark the commencement of the period in which the specialization of the bird begins to be apparent. Then for the first time

lighter-shaded lines below indicate all that is left of the white. By this time the body walls are definitely formed, and rudiments of the feathers are already present. "The head is still disproportionately large, and the eyes are of enormous size. The beak, which was absent in the earlier stages, has now grown out from the front of the face, and at once gives the head a distinctly avian appearance. The neck is long and slender. The body is much more bulky than before, largely owing to the great size of the heart and liver. The limbs have greatly increased in length, their several segments are well established, and the division of the distal ends into fingers and toes is very evident. The white of the egg has disappeared, a thick and very viscid mass alone remaining at the lower surface of the egg. The yolk-sac is still large, but its walls are flabby owing to the absorption of a large part of its contents as food by the embryo" (Marshall).

From this time onwards the principal business of the chick, for such it may now be termed, is to grow, and it only remains necessary to indicate a few of the changes which take place, bringing about the distinctive type of the species and variety.

As already seen, the feathers begin to appear on the ninth day. Then the sacs in which they are contained commence to force their way through

the skin, and by the thirteenth day these are found all over the body, to the length of a quarter of an inch, and can be recognised as feathers by the naked eye. They, however, remain in the sacs until hatching, when these sheaths burst and are thrown off.

On the eighth day the beak begins to show itself, first as a chalky-looking mass, which by the twelfth day has developed into a horny beak, though still soft. It is not until the thirteenth day that the nails take their form, and by the sixteenth day these, together with the beak, harden considerably.

About the sixth day movements can be discerned in the embryo, but these are comparatively slight until the fourteenth day, for it retains the same position all this time, namely, the body is at right angles to the long axis of the egg. At the period named a definite change of position is to be noted, for the bird now moves so that it lies lengthwise in the egg, its beak touching the inner shell membrane, the air space at the broad end having greatly increased in size. This is the position a chick must occupy in order to make its way out of

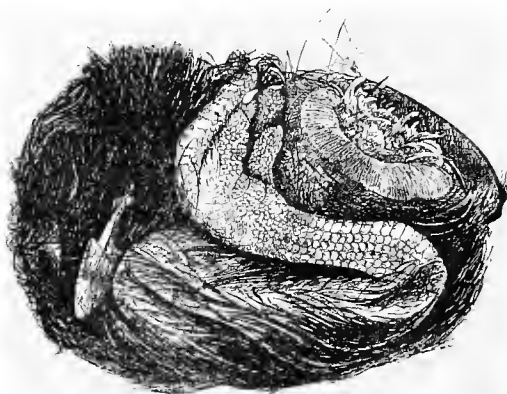
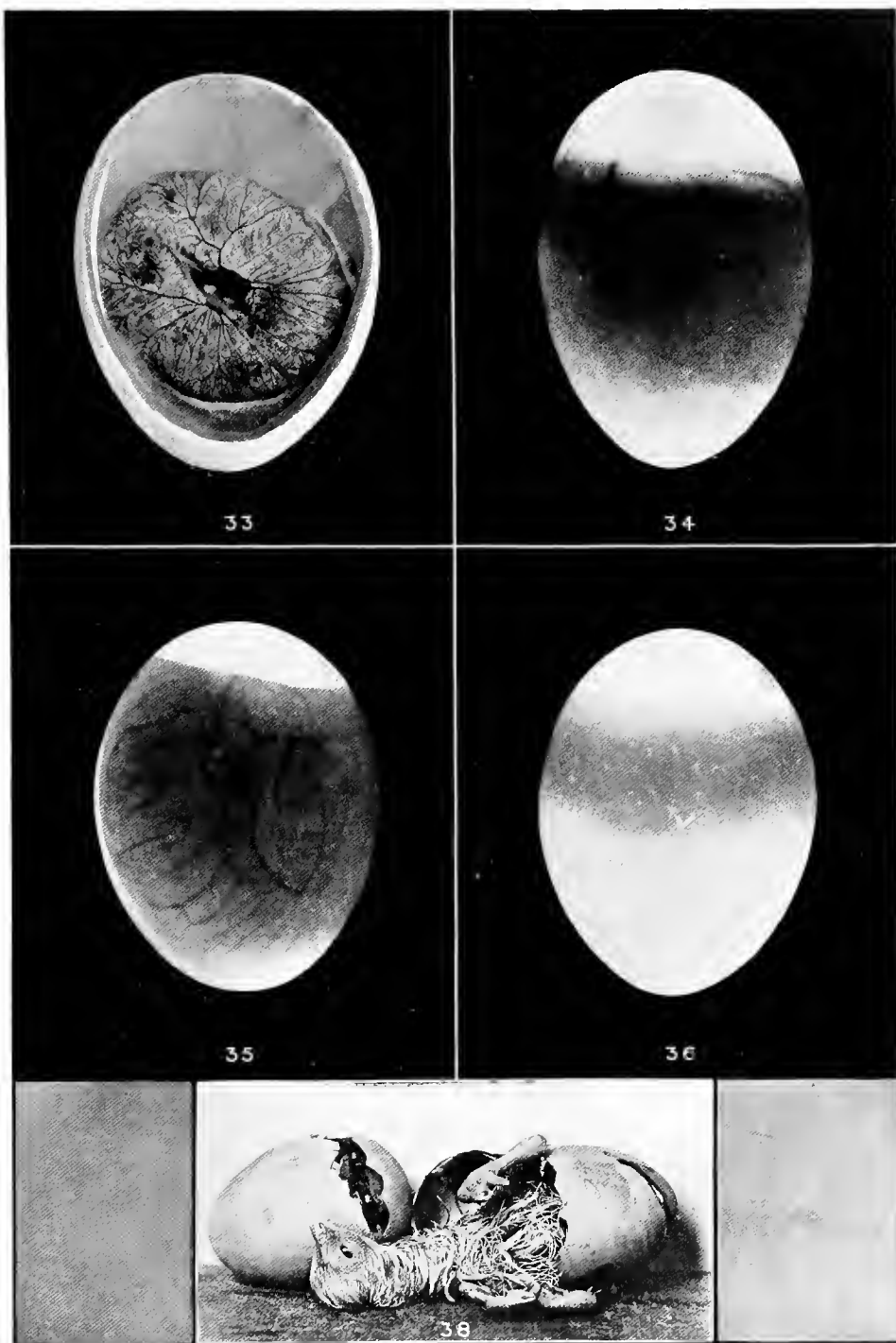


FIG. 37.—CHICKEN IN SHELL (IMMEDIATELY BEFORE HATCHING).



[Photo, C. E. Hearson.

EMBRYONIC DEVELOPMENT OF THE CHICKEN.

FIG. 33.—Embryo, 4th day, *in situ*. FIG. 34.—Fertile Egg, 14 days. FIG. 35.—Fertile Egg, 7th day.
 FIG. 36.—Infertile Incubated Egg, 14th day. FIG. 38.—Exit of the Chicken.

the shell, for if not so placed we shall have a false presentation, and probably inability on the part of the chick to make its way out.

By the twentieth day the chick has grown so as to fill all the shell except the air space. The position is very beautifully shown by Fig. 37, drawn after Nature, and from which the shell and membrane have been removed. By this time the yolk has been almost entirely absorbed, and what remains in the sac is drawn into the body, the walls closing over it at the umbilicus. This yolk serves to supply the chick's need for twenty-four to thirty hours after hatching, for Nature always provides in this manner for the first separate existence on the part of its creatures.

PROCESS OF HATCHING.

We have only now to describe the actual process of hatching. When ready for this work, the chick has only to lift its head and pierce the inner shell membrane, which it can easily accomplish under normal conditions, when it at once commences to breathe the air contained in the chamber. The doing so causes

the pulmonary circulation to become functionally active, and the blood now ceases to flow through the umbilical arteries. As a result the allantois shrivels up, its purpose having been served. The head is lifted into the air-chamber, and the chick has now room to deal blows upon the shell, which repeated upon the same place result in fracture of the shell. Turning round a little, this process is repeated, and so on until the shell is broken round about one-third from the broad end. When completed, by pressing its head against the broad end and its feet against the other portion, it is enabled to throw off the shell, and so it steps out into the world (Fig. 38).

Briefly stated, we have here the process of development, but whilst we can observe and describe many of the processes taking place within the shell, the mystery of life itself, as of the influences which give us the great divergences of type in our fowls, are still among the great secrets of Nature, who seems to say, and in no hesitating manner, "Thus far shalt thou go, and no further." We may speculate in this direction, but of positive knowledge there is comparatively little.

CHAPTER X.

ANATOMY OF THE FOWL.

SPECIAL CHARACTERISTICS OF BIRDS—SKELETON—STERNUM—SCAPULA AND FURCULA—WINGS—LEGS AND FEET—
HEAD — DIGESTIVE ORGANS — CROP — GIZZARD — INTESTINES — VASCULAR SYSTEM — RESPIRATORY ORGANS—
OVARIES—SENSES.



HERE are five special characteristics which distinguish the skeleton of birds from that of mammals (Fig. 39): (1) The greater lightness of bone, many of the bones containing large air cavities, in order that the bird may be able to rise in the atmosphere, not only by reason of the reduced weight to carry, but also that the air cavities aid in the flight. (2) The marked tendency of bones, at first distinct, to fuse with one another in the adult. This is present to a certain degree in all animals, but to a lesser extent in mammals than in birds. If we compare the head-bones of a chicken with those of a fully developed fowl, we find a marked proof of this fusion. (3) Modifications in the limb-girdles and limbs, fitting the bird both for walking and for flight. (4) Great length of vertebral column, with elongation and flexibility of neck, the neck being equal in length to rest of the column. (5) The rigidity of the body proper, which in itself has practically no movements.

SKELETON.

The body itself differs from that of mammals, as it is broad in front and narrow behind. The backbone is flat, and, together with the vertebræ of the neck, contains the spinal column, but at the posterior end is a continuation known as the pelvic girdle, which consists of three bones, and the whole is spoon-shaped on its inner side, widening out at the back. Below the ilium, next to the body proper, is a depression in which the kidneys lie. The caudal vertebræ has a terminal, called the pygostyle, holding the sickle feathers of the tail. From the backbone spring the ribs, of which there are seven on each side; two of these, the cervical ribs, are short, and not attached to the breastbone, or sternum; the other five, known as the thoracic ribs, turn backwards at first, and then reverse, joining the sternum, the vertebral portions being thicker than the sternal.

STERNUM.

The sternum, or breastbone, is very large, and projects back far beyond the ribs, and over the greater part of the wall of the abdomen. This is a spoon-shaped blade of bone, wide and stout in front, narrowing in the middle portion of its length, but widens somewhat behind, forming a protection to the chief organs, which lie in the cavity between it, the backbone and ribs. The keel is a prominent narrow blade attached to its outer side, slightly thickened in front, its depth depending upon the size of the wings. The object is to accommodate the muscles which work the wings. In some breeds it is greatly abbreviated, due to small wings, and where this is the case the quantity of muscle, or flesh, carried on the breast is relatively small.

SCAPULA AND FURCULA.

Connecting the sternum with the shoulder is a stout straight bone, the point of connection being termed the scapula, known as the coracoid, near which are two clavicles, a pair of slender curved bones, whose upper ends are slightly expanded, forming the furcula, or merry-thought. This furcula is a spring used in working the wings, and it varies in accordance with their size.

WINGS.

The wings of a bird correspond to the fore-limbs of animals, but are carried upon the body. When folded in a position of rest, the three parts are bent on each other like the letter Z, the elbow pointing backwards and the arm upwards. The humerus, or bone of the arm, is single, slightly curved, and expanded at both ends; the forearm has two bones: the radius, slender and nearly straight, and the ulna, much stouter and slightly curved, the two joining at either end; the wrist connects with the manus, or hand, in which can be distinguished a thumb and two fingers, more or less rudi-

mental. This mechanism, together with the feathers, is the basis of an instrument of locomotion. On the posterior border of the hand, forearm, and arm are the wing feathers, the length of which diminishes nearer the body.

LEGS AND FEET.

The hind-limb, or leg, is formed for walking and perching. It is long, and composed of a femur, or thigh-bone, a cylindrical, slightly curved shaft with enlarged ends; of a tibia, or leg-bone, large, stout, and nearly straight, though in some breeds it is much heavier than in others; of a stout straight bone, known as the tarso-metatarsus; of an ankle-joint; and of four or five digits, or toes, attached to the foot. Four toes is the regular number, but several breeds have five. These toes are: the hallux, or great toe, behind, and the second, third, and fourth toes in front, the third being largest. Each is fitted with a claw. A fowl walks on its toes, not feet, and they have great power in gripping. The spur of the cock is a small, irregular nodule of bone, varying in size, and intended for defence. The thigh is covered with muscle and sinew, differing in quantity, according as a fowl chiefly uses its pedal limbs or wings.

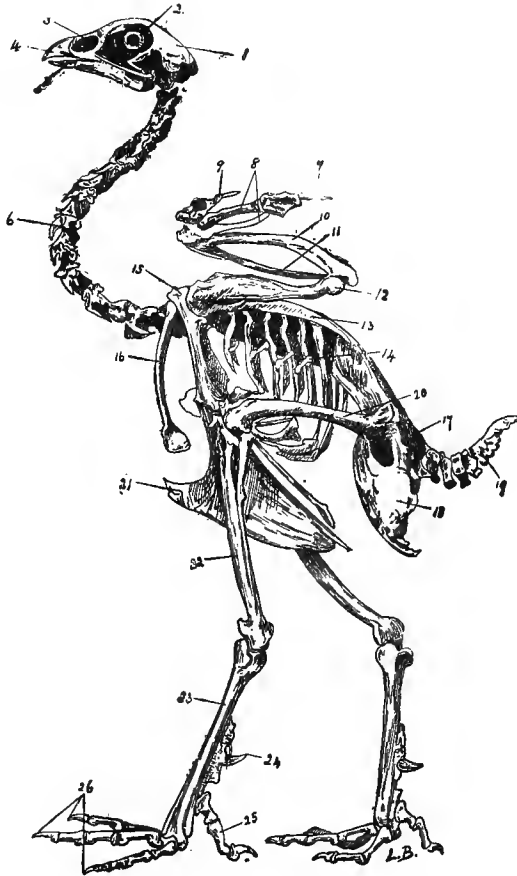


FIG. 39.—SKELETON OF THE FOWL.

HEAD.

A fowl's head is small in relation to other parts of its body, with which it is connected by a long, thin column of vertebræ.

The characteristics of a bird's skull are: (1) Its great lightness; (2) the marked tendency of the bones of the cranium to fuse together, most of the cranial sutures being closed, and the two outlines of the bones obliterated by the end of the first year; (3) the large size of the orbits, or eye spaces, these being separated by a thin vertical plate; (4) the prolongation

of the face forwards into a conical toothless beak. The head is composed of two parts: a cranium and a face. The cranial portion is a somewhat conical box of bone, the base of the cone forming the hinder part of the skull, and the apex being directed forwards. In the aperture thus formed is placed the brain and eyes. The beak is divided into a superior, or upper, and an inferior,

or under, mandible. The jaw, or superior mandible, has, owing to a peculiar union with the cranium, a mobility which is not seen in mammalian animals. The two nostrils are small, and the olfactory capsules remain cartilaginous throughout life. The nasal cavities are separated by a thin piece of bone, and open into the interior of the mouth by a simple slit, long, narrow, and longitudinal, and furnished with small indentations. This slit opens when the bird's head is turned downwards, or in its natural position, and shuts when raised. It is for this reason that fowls when they drink are obliged to raise the head, otherwise the water would run out of the nostrils. The lower mandible is slightly shorter than the upper. Fowls have no teeth in either the upper or lower mandible. The brain is situate in the back part of the skull.

- | | | |
|--------------------------|--------------------------------|-----------------------|
| 1. Skull. | 10. Ulna. | 19. Pygostyle. |
| 2. Eye Cavity. | 11. Radius. | 20. Femur Bone. |
| 3. Nasal Cavity. | 12. Humerus. | 21. Sternum, or |
| 4. Upper Mandible. | 13. Backbone. | Breastbone. |
| 5. Lower Mandible. | 14. Ribs. | 22. Tibia. |
| 6. Vertebræ of the Neck. | 15. Scapula. | 23. Tarso-metatarsus. |
| 7. Digit. | 16. Clavicles (Merry-thought). | 24. Spur. |
| 8. Bones of Hand. | 17. Acetabulum. | 25. Back Toe. |
| 9. Digit. | 18. Ischium. | 26. Toes. |

DIGESTIVE ORGANS.

Dr. Lardner thus describes the digestive organs of birds:* The œsophagus at the lower part of the neck enters

the first stomach, called the crop, which is an enlarged pouch enclosed by membranous walls, the form and magnitude of which differ in different species.

* "Handbook of Animal Physics," p. 483. London: Lockwood and Co.

CROP.

The crop is most developed in granivorous birds, less so in birds of prey, and is altogether absent in the ostrich and most piscivorous birds. Immediately below the crop there is a contraction of the canal, followed by the dilatation called the *ventriculus succenturiatus*.

GIZZARD.

Although this enlargement is not considerable, it plays an important part in the phenomena of digestion, its sides being covered with glandulous follicles, which secrete a juice analogous to the gastric juice. This ventricle is larger in birds which are destitute of the crop than in those which have that organ. This second stomach is succeeded by a third, the gizzard, in which the chymification of the food is completed. This part of the digestive apparatus is furnished with a muscular tunic, which has great thickness and power in granivorous birds. In the ostrich its strength is so great that the hardest substances are crushed by it. It seems to be endowed with the functions of an apparatus of mastication. The intestine which follows this consists, as in mammals, of a small and large tube of different lengths, the former being much the longer and coiled up in folds, as in mammals. At the point where the small enters the large intestine, two tubes, called cæcums, enter it, which are closed at the upper ends. These are generally long and large in granivorous and omnivorous birds, but little more than rudimentary in birds of prey.

INTESTINES.

The thorax and the abdomen are not, as in mammals, separated by a diaphragm muscle; and the liver, which is very voluminous, fills the chief part of both cavities. It is divided into two lobes nearly equal in size, from which issue two ducts, which, after uniting, open into the intestine. There is generally a gall-bladder, which receives a portion of the bile, pouring it into the intestine by a separate canal.

The pancreas is lodged in the first fold of the small intestine, and is generally long, narrow, and more or less divided.

The spleen is small, and its uses are as little known as in the case of mammals. The kidneys, on the contrary, are very voluminous, irregular in form, and lodged behind the peritoneum in several cavities formed along the superior part of the pelvis. They do not, as in mammals, possess a distinct cortical substance. In that part of the great intestine which corresponds to the rectum, there is an enlargement called the cloaca, into which the liquid secreted by the kidneys is discharged, and mixed with excrements expelled from the intestines.

The nutritive products of digestion, as in mammals, pass from the intestines into a system of lymphatic vessels connected with it, which converge into two thoracic ducts, which discharge their contents into the jugular veins at each side of the neck.

VASCULAR SYSTEM.

The vascular system of fowls consists of a heart with four chambers, from which the blood is distributed by means of arteries. The blood is about 2° warmer than that of mammals, due to the fact that the body heat is retained by the feathers, which are bad conductors.

RESPIRATORY ORGANS.

Respiration is secured by lungs, which are fixed to the back of the fowl, and maintained below by a resisting membrane, which, in order to secure the inhalation and exhalation of air, is moved by muscular power. The lungs are pierced with holes, and thus the air is able to circulate all over the body, even to the bone cavities. The trachea, or windpipe, is long, which, together with the bronchi, has cartilaginous rings. The lungs themselves are surrounded by air-sacs, forming reservoirs, and there are others, nine in all, in the breast and lower part of the abdomen. These give a lightness to the body, and enable birds to rise easily from the ground.

OVARIES.

In the hen are two ovaries, but it is found that only one is active at the same time. In appearance the ovary is not dissimilar to a bunch of grapes, the ova varying in size from small specks to full-sized yolks, when the bird is productive. As each ovum comes to its full maturity, the process of filling the yolk-sac having been in operation for some time, there is a rupture of the ligament by which it is attached to the ovary, and it falls into the open mouth of the oviduct, a tube about 2 feet in length, and during its passage down this tube it is first impregnated with the male element, and then coated with successive layers of albumen, with the two shell membranes, and finally with the shell, the whole process taking about eighteen hours. At first the germinal vesicle is situate in the centre of the ovum, but as it increases in size it rises towards the upper side. The male reproductive organs (testicles) are two in number, and are found in front of the kidneys.

SENSES.

The brain of fowls is well developed, but the various senses vary very much from those of mammals. The skin is not sensitive, due to the fact that it is covered with feathers. These feathers are composed of a stem with a hollow base, and inserted in a bulb, and attached to the stem are barbs, covered with down, hardly visible, however, to the naked eye. Taste and smell are neither very keen, the tongue being the most sensitive in this respect. Still, at the same time, fowls reject those things which are objectionable to them, but probably this is more due to sight and memory than from any other cause. The sight of poultry, as of all birds, is very piercing. They are also very acute in hearing.

CHAPTER XI.

MANAGEMENT OF BREEDING STOCK AND THE SITTING HEN.

EFFECTS OF DOMESTICATION—CAUSES OF INFERTILITY—ESSENTIALS TO SUCCESS—NUMBER OF HENS WITH COCK—ELEMENTS IN HATCHING—EAST WINDS AND HATCHING—PLACES FOR HATCHING—HATCHING-BOXES—HATCHING-ROOMS—OUTSIDE FEEDING-CAGES—MAKING THE NEST—COOLING EGGS AND FEEDING HENS—DAILY EXAMINATION—HATCHING BY TURKEYS—HATCHING REGISTER—TESTING THE EGGS.



NATURE is a marvellous mother. In all her steps every provision is made for the well-being of creatures born into the world, and no study presents more features for investigation than the production of animal life. There are no wheels missing in this machine, no methods which we could improve upon. There is a completeness which utterly puts to shame all the inventions of man. And with respect to the formation of chickens in the shell, there is nothing more wonderful within the whole realm of Nature. When we look at an egg we are astonished at its form, its symmetry, its strength; but we could never imagine, if we did not know, that the white within an egg contains all elements to form a chicken, and that the application of heat and moisture will produce from it bone, flesh, and feathers, all of which need many various materials in formation. They are produced in different fashions, and, we could almost say, under different conditions.

It must be remembered, in approaching this subject of incubation, that by domestication we have altogether altered the environment of fowls, and we therefore must expect that the same results will not be secured as under natural conditions. Too much is, we think, made of the "copying Nature" theory. The whole aspect of things has been changed, and what would be perfectly suitable in one case is altogether unsuitable in another. Eggs laid by birds in a wild state, so far as our observations go, seldom fail to hatch. But this does not prove that eggs laid by domesticated fowls would hatch as well if set in the same way. It cannot be gainsaid that domestication has resulted in a weakening of constitution, but it has brought an increase of size in all breeds except Bantams, and a stimulation of the laying faculty. Careful poultry-keepers do all they can to overcome this weakening of constitution,

in some cases by allowing full liberty, but it appears to be utterly impossible to obtain the same surety in hatching as is met with in wild fowls.

CAUSES OF INFERTILITY.

In the first place, eggs are less fertile, for an infertile egg would be a *rara avis* in a wild bird's nest. The cause of this infertility may possibly be due to the larger number of eggs produced by birds in domestication, but it also arises from reduced vigour of the male bird. Then, again, a very large number of eggs are lost during the process of hatching by their becoming addled—that is, the germ in the earlier, or the chick in the later, stage dies. Such fatality may be due to several causes, such as want of strength in the embryo, caused by reduced vitality in the cock, already mentioned, to improper conditions under which the hatching is carried on, to want of moisture, or to lack of attention on the part of the hen. One reason why wild birds seldom desert their nests is, that they do not commence sitting until the proper season has arrived, and consequently there is not the same risk of changes in the weather. Also, a hen knows by her instinct what kind of place is most suited to her nest. This might at first be thought to be conclusive that hens should be allowed to sit where they like. But we must remember that domestication has enormously increased the number of fowls, and, therefore, what would be best for them in a wild state, where the nests are few and far between, is not equally so when they are numerous. And, again, if we wish to make poultry-keeping really profitable, it is necessary that hatching should commence early. Therefore, if we permitted the hens to sit just when and where they thought fit, it would mean our being too late. Almost every poultry-keeper who desires to obtain early stock has to depend upon other than his own yard for broody hens early in the year,

or upon an incubator; for if he relies upon his own stock, unless he keeps a breed that makes sitting the rule of life, he will not be able to secure sitters when he needs them. In this point the letting alone, or so-called "natural," system does not work advantageously.

ESSENTIALS TO SUCCESS.

In the sitting of hens there are several things essential to success. We do not mean by this that unless these are observed hatching is impossible, for we have known eggs hatch under the most untoward conditions, and in spite of most disadvantageous circumstances. But such a state of affairs must not be reckoned upon. The first essential to success is vigour and stamina of the stock birds. The dangers of in-breeding have already been pointed out, and one of the most frequent results of this close breeding is that very large numbers of the eggs produced are infertile, or become addled, or die during the early stages after hatching. Many instances could be cited in proof of this contention. Vigour in the stock birds is absolutely necessary, if the progeny are to be healthy and strong, and we require strong, healthy, untainted birds upon good runs.

NUMBER OF HENS WITH THE COCK.

Another matter which requires attention is that there shall be enough, yet not too many, hens running with the cock bird. It is generally known and accepted that too many hens with a cock bird will result in a large number of infertile eggs or of weakened chicks, but there are not many who understand that the same result may be due to the hens being too few. All depends upon the breed and the vigour of the male bird. Some of the more vigorous breeds need from six to twelve hens, according to the season of the year, and less would be hurtful to the hens; whilst there are others, less vigorous, for whom six hens would at any time be too many, and in the colder season two or three are sufficient. There is, of course, also a difference in individual hens of the same breed, and no certain rule can be given that will apply to every case. The best plan is to give the heavier varieties three hens early in the year, increasing up to six as the weather becomes milder; and in the case of the lighter and more vigorous varieties, giving five or six at first, and increasing the number to ten or twelve. If the hens seem to be distressed, and show this by the loss of feathers on their backs, then more hens should be given at once. There is also another cause of infertile eggs, and one which is often unsuspected, viz., that the cock bird does not get sufficient food. His gallantry to the ladies of his harem leads him to see that they are all fed before he partakes of any food, and if there is only a limited supply, or they are fed by an attendant who only throws down as much as the birds appear to eat greedily, then the probabilities are that he will not get

half enough to eat. This is a matter which needs attention, and often explains the laying of infertile eggs.

ELEMENTS IN HATCHING.

Heat, moisture, and occasional cooling are the factors at work in the production of chickens. Heat is, of course, supplied by the hen, who also, if she be a good sitter, will see to the cooling, though, as a rule, it is better not to trust entirely to her for this. But moisture is beyond her control if the place of sitting is allotted to her. In some districts there is no trouble whatever on this score, as the atmosphere is naturally charged with sufficient for the needs of eggs. But in others very great care has to be taken, or dryness of the atmosphere will be fatal to successful hatching. Seasons also differ. A very dry spring will demand more attention being given to the question of moisture than a moist one, and thus the poultry-keeper has to use his brains if he wishes to be successful. There is another influence which must be referred to, as it is a most important one to all those whose places are subject to cold easterly winds. It needs no description to impress this fact upon most poultry-keepers. What is the influence of east winds upon our fowls and their eggs has never been satisfactorily explained, but eggs are less fertile, fertile eggs are very likely to be addled, and hens simply go on strike, unless they are set in places much more comfortable than falls to the lot of the greater majority of human beings. A hen's maternal instincts appear to be lost during such a season, and we have often seen inveterate sitters, who had been known to do their work without interruption during frost and snow, desert their eggs apparently without compunction. If we could learn just what is the cause of all this, it might be possible to find a remedy. As it is, however, we have to give up the thing for the present and simply state a fact.

PLACES FOR HATCHING.

Where there are to be only two or three batches of eggs hatched during the season there need not be much difficulty in providing for them. A hen can be set in some quiet outhouse or shed, where the work will probably go on without any trouble. In this case, if the house or shed can be given up to the hen entirely, it will be best to provide a square box without a bottom, which, standing either upon the earth, if its floor be of that material, or upon sand or earth, if it has an artificial floor, will be the simplest arrangement. This box is best if made to completely cover the hen, but without a front, so that she can leave the nest whenever she wishes so to do. The advantage of a hatching-box like this over a square, open-topped box is that moisture can be given to the earth below during a very dry season without disturbing or alarming the hen. If it is thought desirable, such a box can be made with a door in front, so that if necessity should arise, the

hen can be enclosed. As we shall have occasion to refer to the hatching-box which we have used so successfully, it will be well to give a description. It consists of a box without bottom (Fig. 40), and for ordinary-sized fowls is made about 15 inches square, and 18 or 20 inches high. The material—wood, of course—is $\frac{1}{2}$ or $\frac{3}{4}$ inch boards, and it is built with solid back, sides, and top. The upper part of the front forms the door, which is the width of the box, and 15 inches high. A piece of deal 3 or 5 inches in depth, according to the height of the box, forms the lower section of this front, or, if a 20 inch high box, the bottom piece may be 3 inches, and a similar lath 2 inches wide fixed at the top of the front. The loose portion is made the door, and is hinged at the bottom, fastening to the top by a button. When this door is open it falls downwards, and thus provides a firm footing for the hen in entering or leaving the nest. Three ventilation-holes should be made in each of the sides and back, quite close to the top, and half a dozen in the top, to which a handle can be fitted; but of course these are only needed if there is a door to the box. There are several appliance-makers who sell hatching-boxes with netting stretched across the bottom as a protection against rats, which is a very necessary precaution where these pests are troublesome. Fig. 46 shows a double box with lids, specially for use in hatching-rooms. Such boxes can be used anywhere, whether one or a score hens are set in the same place, and they can also be utilized as laying-boxes when the hatching season is over.

Where only a few hens are to be set, we should advise that later in the season (except in unusually cold seasons), say after the early part of May, the hens have their nests made out in the open. Of course, some shelter will be necessary, but if one of the hatch-

ing-boxes be used, all that will be required is either a rough covering or a coop, or the hen can be set in a coop, and then will not need to be disturbed when her chickens come out. On farms there are often sheds scattered about which can also be utilized. One of the difficulties of this plan—at least, in many parts of England—is that foxes are preserved. A capital arrangement in such districts is the double sitting-box (Fig. 41) made by Mr. T. Rothery, Stutton, Tadcaster.

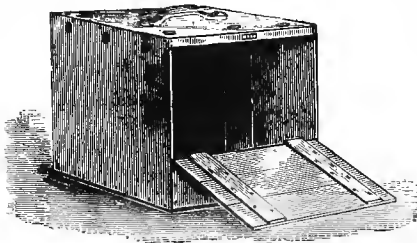


FIG. 40.—CLOSE HATCHING BOX.

Perhaps one of the best plans for those who have large farms is to put the hatching in charge of some of their labourers, so that they can rear the chickens near their residences. The usual plan is to pay a specified sum per bird hatched and reared to a given age. In this way cordial co-operation by those taking charge of the sitting hens is secured. This applies only to those who go in for poultry-keeping on a large scale; but if poultry are to be made to pay, it is desirable that the attendants should have some direct interest in their success. However slight this interest may be, it will prove a stimulus to greater care and effort, and far more than repay the outlay involved.

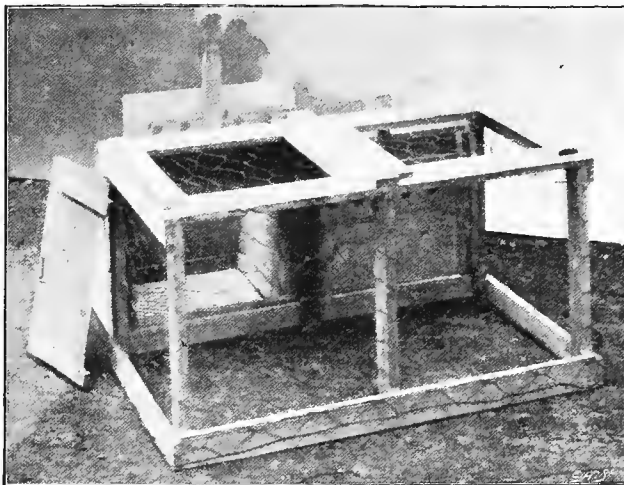


FIG. 41.—DOUBLE SITTING BOX.

HATCHING ROOMS.

By the expenditure of a little trouble arrangements can be made by which a large number of hens can be set in a single room, and it is only by reason of the trouble that we suggest non-adoption of the plan in small poultry-yards. Still, even there, and especially when ladies undertake the work of attending to the

fowls, it is much more convenient to have the hens in a room. In selecting a room for the purpose of sitting hens, it is desirable to have one as little subject to variations of temperature as possible, for there is then much less danger from sudden frosts. But it must be sweet and clean. It is necessary that the hatching-room should be perfectly dry. If the atmosphere is

somewhat damp it will be none the worse, moisture being a most important element in hatching operations. Then, again, if it is rather dark hens will sit all the better, but in any case the sitting-room should be darkened if it is not already sufficiently so. The thing to avoid most of all is a hot, dry place, for there it will be almost impossible to succeed in hatching operations.

The plan we have adopted, and with the greatest success, is to place several of the hatching-boxes already described in a special house, with their backs to and about a foot from the walls. In a room 15 feet square sixteen or eighteen of the hatching-boxes can be accommodated, and we have had as many as twenty going at one time. Each box should be at least 6 inches removed from its neighbour, so that there may be a free current of air all round, for air is a most important factor in the hatching of

French in idea, and can be confidently recommended. This consists of a house fitted with sitting-boxes in two tiers. These boxes differ from those already described, in that they have lids on top and the hens are lifted off the nest. Outside the house is a covered shed, where the feeding-cages are placed, as described in the next paragraph.

OUTSIDE FEEDING-CAGES.

An excellent arrangement (Fig. 43), which we have proved most effective, simplifies the work where a large number of hens are sitting at one time. As a rule, baskets are employed with lids on top, and the nests made in much the same way as already recommended. Outside the hatching-room, but under a shed, is a row of half a dozen square coops with barred fronts. Every day each hen is placed in one of

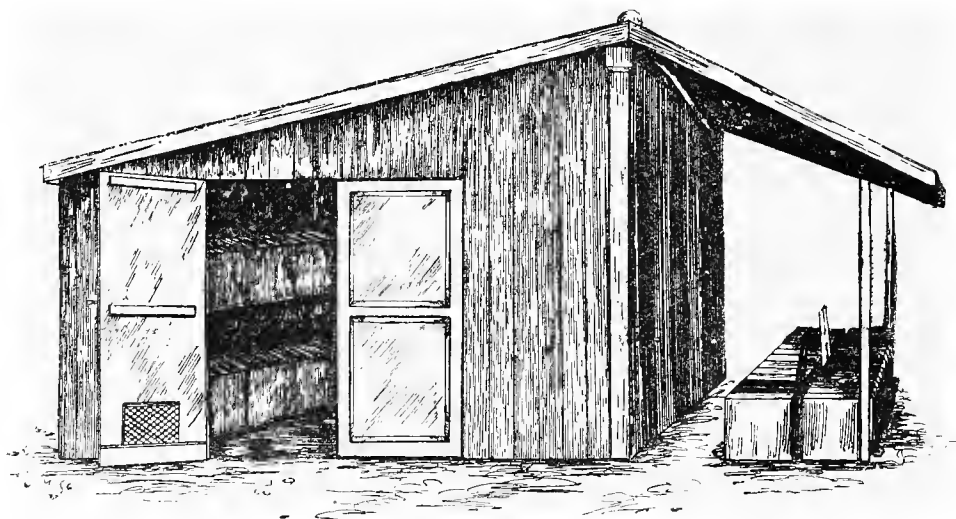


FIG. 42.—HATCHING-HOUSE.

eggs. Thousands of eggs are addled, or the chickens asphyxiated, by foul air with which they are surrounded, and which the chicken, if it can be so termed at that early stage, within a shell is thus compelled to breathe. There should be a layer of fine earth or ashes, say 6 or 7 inches thick, on the floor, upon which the hatching-boxes are to be placed. This layer is better if continued entirely around the room, and in no case should it be merely enough for the box to stand upon. The reason for this will be explained afterwards. It will thus be seen that, when the boxes are all placed in position, the doors will face towards the centre, for it is necessary to have doors on the hatching-boxes when this plan is followed.

The form of hatching-house illustrated in Fig. 42 is

these coops for about half an hour, in order to feed and dust herself, during which time the basket or the hamper is left open so that the eggs may be cooled. The floor of the coop is thickly covered with fine dry earth or ashes, which the fowls enjoy, and thus rid themselves of parasites. If six hens be fed at the same time, and each one be removed to the feeding-cages in rotation, there is no danger of returning them to the wrong nest. We may here mention that a mistake is made in not cooling eggs sufficiently. Later observations have shown that with a temperature above 45° an hour is not too long. More harm is done by under than over cooling, for there is much truth in the old saying that "a close sitter is a bad sitter."

MAKING THE NEST.

In making nests within the boxes, a shovelful of earth or ashes is first placed therein, and then hollowed out into basin shape, taking care that all the corners are filled, lest any of the eggs roll therein and are chilled. There are breeders who use damp grass sods, but as the object of both earth and sod is to give that cool dampness which is so essential to successful hatching, earth is to be preferred, as it can be made to fill up the box better. Upon this earth a nest is made of fine straw, oat straw preferred, and which is all the better if well beaten or rubbed in the hands before being placed in the nest. When completed, the nest should be slightly below the level of the cross-piece at the front. The eggs should have no tendency to roll out, but always strongly incline to the centre of the nest. As a rule, when eggs are placed in a hatching-box, and a broody hen put down before it, she will go on at once of her own accord, but sometimes it is not so. It is always desirable, therefore, in setting hens, when they are put to a strange nest, to let them have a few added or dummy eggs at first. This is to prevent valuable eggs being wasted. When the nest-boxes with lids are employed they must be placed on the nest. We prefer night for setting hens.

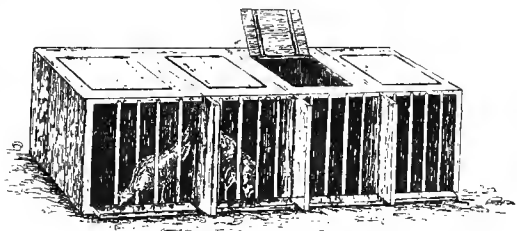


FIG. 43.—FEEDING CAGES FOR SITTERS.

COOLING AND FEEDING.

So far all is right, and there are no difficulties in the business. But if there are twelve or fifteen hens sitting at one time, and all these have to be liberated for feeding and dusting separately, it will be seen that the attention of someone will be pretty fully taken up. The hens must be allowed out daily, and they cannot be let out together, or there will be conflict, resulting in general disaster. This can be obviated by the plan already recommended. If the time of an attendant can be given to the sitting hens, a simple way is to open the door of each box in turn, give the hen half an hour, then close her in, and open the next. Should any not have come off, they must be lifted, both for their own sake and cooling the eggs. The earth or ashes below the box will provide much of the dampness needed by the eggs, but in a very dry place, or during dry weather, it is desirable to keep the earth moist by pouring on it, around the box, a pint or two of hot water daily. This is much to be preferred to moistening eggs themselves, a plan, we think, which does more harm than good.

There is yet another plan which we have at times

adopted with great success. At one time we had a large loft fitted up with pens in which exhibition and surplus birds were kept. These pens were, as a rule, about three feet square, and in double tiers all round the loft. In each of these was a hatching-box, standing it upon earth in the manner already described. Food and a dust bath were placed in every pen, with a dish of water, and every morning the doors of the boxes were all opened for a couple of hours, thus allowing the hens to come off whenever they thought fit, when they were closed again. This plan, of course, greatly minimized labour in attending upon the hens, but it had one drawback, namely, that it did not give an opportunity for that daily observation of each nest which we regard as most important. Fouling of a nest, or accidental breaking of an egg, if not seen to at once, will almost certainly be fatal to success in hatching. And we have always made it a practice to examine the various nests every day. If it were not for this, the plan of setting hens in pens such as we have described would be the best. It does not answer to disturb a hen when she has been off her nest, for very often she resents it, and in the scrimmage there is danger that some of the eggs will be broken. When a hen has to be lifted off, it is necessary to exercise very great care in doing it, to

avoid breaking any eggs. Hens usually tuck the eggs tightly under their wings, especially when disturbed, and if a hen be lifted up bodily, the chances are all in favour of an egg dropping down upon others in the nest and making a general smash. Therefore, in lifting off a hen, the hand should first be slid under each wing so as to lift the latter from the eggs, and then the hen lifted off by her wings. Properly done, this method will effectually remove all danger of broken eggs from the cause already named. Sometimes an egg is accidentally broken, and the contents adhere to her breast and to the shells of eggs remaining in the nest. If this be the case, a breakage is certain to result unless the matter be put right. Should a hen foul her nest, which will never take place if she be let out at regular periods, the same result may accrue. It is to prevent this kind of thing that we advocate daily examination of nests. And as it is desirable not to allow a hen to be disturbed more than is necessary, this should be done at the time of feeding.

Hens should be fed on hard grain, such as wheat, or barley, or oats; they should be provided with fresh water daily, and have a good dust bath. The latter is most important, as in warm weather hens

are often so pestered with fleas that they desert their nests. For this reason we have found it an excellent plan to dust a little black sulphur, or some carbolic powder, through the straw. Nests should also be made afresh after every hatching, and hatching-boxes should be well limewashed two or three times during the season.

HATCHING BY TURKEYS.

In some parts of France large numbers of chickens are hatched under turkeys, and the same plan has been tried successfully in this country. Should a hen turkey become broody in her first year, when it is inadvisable

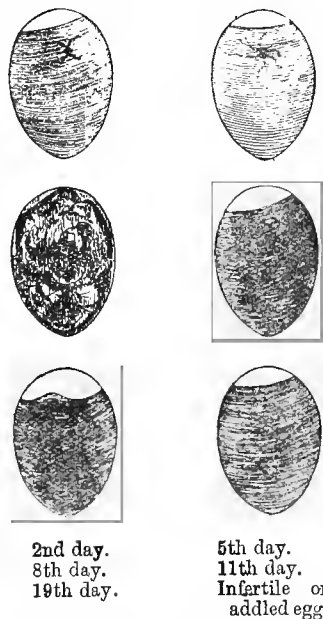


FIG. 44.—APPEARANCE THROUGH SHELL DURING INCUBATION.

to breed from her, she may be usefully employed in this manner. Not only will she cover twice the number of eggs, and brood three times the number of chickens that can be given to an ordinary hen, but she is most reliable, is less affected by weather, and ready when called upon at three or four days' notice. Moreover, the male birds can be used in this way as well as the females.

REGISTER OF HATCHING.

It is an excellent plan to have a book containing a register of the hatching operations, so that records can be kept for reference, both present and future. Each sitting-box should have attached to it a card or label

easily seen by the attendant. The following is a simple form for this purpose:

Breed of eggs	...	...	...	...	—
Date set	...	...	...	...	—
Date to hatch	...	...	...	...	—
Number of eggs...	...	...	...	...	—
Number fertile on seventh day	...	...	...	...	—
Eggs broken	...	...	...	...	—
Chickens hatched	...	...	...	...	—
Remarks:	...	...	...	...	—

TESTING THE EGGS.

At one time many poultry-keepers had a very decided objection to in any way interfering with the eggs during the time of sitting; but this has been shown to be a merely sentimental objection, for there are very many advantages in so testing them. We ourselves, both when hens were doing the work, and when the eggs were in incubators, have always tested the eggs twice during the process. The first time is on the seventh day, and then by candle light. The object of this test is to see how many of the eggs are fertile, so that those that are clear can be taken away, and as they are still good for culinary purposes, it will be seen that on that account alone there is a very strong argument in favour of the

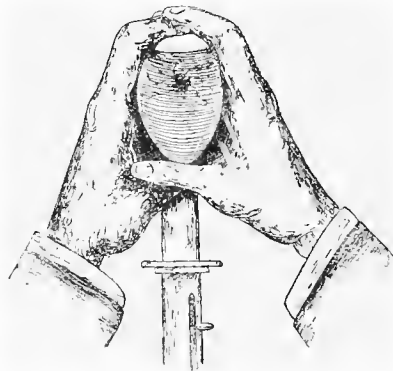


FIG. 45.—HOW TO TEST AN EGG BY CANDLELIGHT.

system. In large establishments some hundreds of eggs can be saved every year in this way, which will represent a respectable item in the year's returns. But there is another and still more important argument in its favour, and that is, the space occupied by these useless eggs can be filled up, and the work either of hen or machine be used for such eggs as are of real value for hatching purposes. For instance, if three hens are set at one time—and we always set two or three together—and on the first examination it is found that one-third of the eggs are infertile, when the useless ones are removed there will be just sufficient for two hens, and the third hen can be set again with a fresh batch of eggs. The fact is that this test enables, as a rule, as

many chicks to be hatched with two-thirds the number of hens that would be needed under the other system.

Coming to the method of examination, Fig. 44 represents external appearance of eggs when tested by

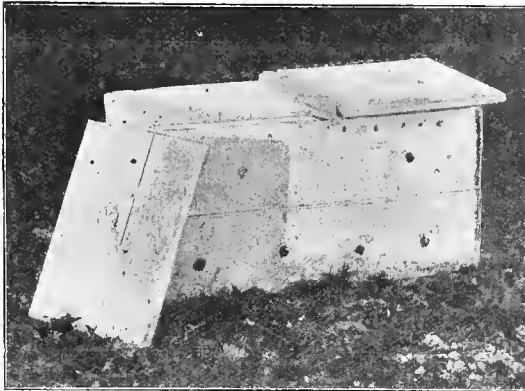


FIG. 46.—DOUBLE HATCHING-BOX WITH LIDS.

light during the process of development. First remove all eggs from the nest either when the hen is feeding or after lifting her off for the purpose, and hold them between a candle or lamp and the eye. The best time to do it is at night, and a candle can be placed at a convenient height for the purpose. Then take an egg in the left hand, holding it between the forefinger and thumb, using the other fingers of the hand as a shade to keep the light from the eye. The right hand is next put around the part of the egg left exposed, and the fingers of that hand used also as a shade (Fig. 45). The object is to only permit the light to be seen by the eye through the body of the egg, and a very little practice will enable anyone to hold it properly. Some use cardboard, cutting it in an oval hole scarcely so large as the egg, and there are also egg-testers sold at about a shilling each, made of tin covered partially with black cloth. These are perhaps the simplest, though we have always been able to test much more quickly when using only the hands, as already described. In Fig. 47 is shown a powerful testing-lamp, by which the germ can be distinguished at forty-eight to sixty hours. When the egg is fertile, the appearances will be as seen in Fig. 44. In this way we can tell whether the egg is fertile, for an unfertile one is clear to the end, no matter how long it is sat upon. Some people we have met with would not accept this test; they thought that perhaps the chick would develop if sat upon a little longer, but every fertile egg by the seventh day has developed sufficiently to declare itself in an unmistakable manner. We have sometimes been deceived when testing incubator eggs at the third or fourth day, but never at the

seventh, and thus it is better, as a rule, to accept that time as the right one for applying the test.

We come next to the second test, which is made on the nineteenth day—that is, two days before the eggs are due to hatch. This is by means of warm water, and it has a double purpose: first, the discovery of all dead eggs, and, second, softening the shell, so that the chick may more easily find its way out. The plan we have always followed is to get a pail or large bowl nearly full of water heated up to 105°, that is, just as hot as the hand can comfortably bear it. If a bowl is used, it should be a deep one, say, having not less than 6 or 8 inches of water in it, and the difficulty of getting one sufficiently deep has generally led us to use a pail. The eggs are removed from the nest and placed in the water, when it will be seen that the majority will float broad end upwards, about two-thirds in and one-third out of the water. Those that sink may be generally regarded as useless and put out of the reckoning, as they are usually added eggs—that is, eggs which have been fertile, but in which the process of evolution has been arrested at some stage of their progress. If, however, the test is delayed until the chick has pierced the inner membrane, the egg will sink. In a few moments some of the floating eggs will be seen to jump about in a curious manner, caused, it is said, by the effort of the little prisoners to get out. It is better when the eggs

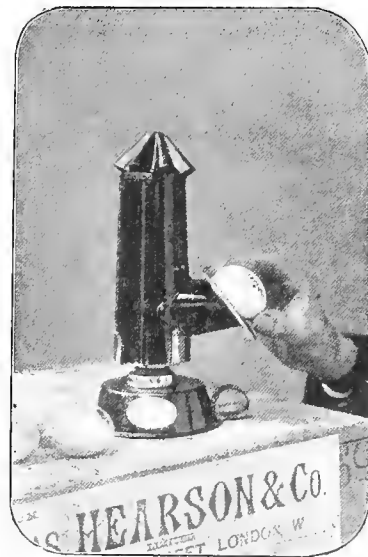


FIG. 47.—TESTING-LAMP.

have been in three or four minutes to put back into the nest, without drying, those that so jump; and if there are any that do not move it may be generally accepted as fact that they are dead. But the test is not always reliable, for the reason stated

CHAPTER XII.

THE REARING OF CHICKENS.

PLACE TO REAR—SOILS—CHICKEN-HOUSES—WINTER REARING—COOPS AND COOPING—CLEANLINESS—PARASITES—
EARLY DAYS OF CHICKENHOOD—FEEDING CHICKENS—DRY FEEDING—SPACE FOR CHICKENS—THE ORPHANS—
DIVISION OF THE SEXES—SALE OF YOUNG CHICKENS.



UCH of the way in which the chicken-yard should be arranged depends upon the space at the disposal of the breeder, and upon the number of fowls he intends to hatch. Where he wishes to raise only a few batches in the year, it is merely necessary to devote one of the poultry-houses and runs to the purpose of rearing; but where the breeding is on a more extensive scale, special provision must be made for the chickens.

THE PLACE TO REAR.

Wherever chickens are reared they must have a dry house or coop and run. Damp is fatal to them, more fatal than almost anything else against which they have to contend. The ideal spot for rearing chickens is on the southern slope of a light or gravel-soiled hill, around which there are plenty of bushes and trees. Unfortunately, however, the majority of poultry breeders have not such a place at command, and they must make the best possible use of their conditions. As they cannot alter these conditions, they must use and improve them to the full extent of their ability. It is, however, imperative that the place shall be dry, and if it is not naturally so, every step should be taken to improve it in this respect. In temperate zones north of the Equator rearing should be, as already stated, on a southern slope, where the incline will help in carrying off water. It may here be mentioned that the best soil upon which to rear chickens is not sand. One of the most important elements in the successful rearing and maintenance of fowls is that they shall have a proper supply of natural food, such as worms, grubs, etc., which can only be obtained from the soil. Insect and grub life is found to a lesser extent in sandy than in any other class of soil, and therefore, while sand may be serviceable as an upper coating from its dryness, it is not the most desirable for chicken rearing. On the other hand, clay soil, by reason of its cold nature, retards growth; and whilst

this is no serious objection where chickens are bred for egg production, it would be fatal if table poultry were to be reared. The longer period of growth means greater expense in rearing, and also that the chickens are not so tender in flesh when killed.

The recommendations here made apply chiefly during what may be termed the regular rearing season. During the summer, under normal conditions, the southern slope of a hill would receive too much sun, and the birds would be adversely affected. This, however, is not found earlier or later in the year, when the most important thing is to protect the growing birds against cold winds—that from the east being most injurious—and rain. Hence as much shelter on the wind or wet side as possible should be given. It is sometimes thought that woods offer the best place for rearing chickens, and this is undoubtedly the case during hot weather, but in the cooler periods of the year the birds do much better on the open ground. The point which we wish to press upon the attention of all breeders is to vary as far as possible the place in accordance with the season of the year, sheltering the birds against extremes, whether of sunshine or of cold. Our greatest difficulty in the United Kingdom is excessive rain, though sometimes a cold, dry spring retards growth more than is the case during a rainy season.

CHICKEN-HOUSES.

A chicken-house is not an absolute necessity except for those who desire to breed very early birds, whether for market or as laying stock. When chickens are reared under hens a coop is generally sufficient, but for colder and more exposed situations what is termed a portable chicken-house, as shown in Fig. 48, is very valuable, giving the inmates much more room than in an ordinary coop, and yet sheltering them against adverse influences. If a house of this kind is placed with its back to the wind and rain, the hen and her brood will be quite comfortable under even the most

unfavourable conditions; less so, however, if the ground is heavy than where it is of a light nature. The large brooder-houses used for chicken-rearing, and shown in Chapter XIII., are more especially intended for use where artificial systems are in vogue. As a rule, the double coop shown in Fig. 52 is sufficient for the purpose, for here we have the minimum of exposure with the maximum of natural conditions. Under ordinary circumstances, for very early broods, if there is a large barn or covered shed available, in or under which the coops can be placed during unfavourable weather, no special house is required for the purpose. One of the best arrangements we have seen in this direction was a large thatched shed, which was used for storing carts and implements at other seasons, but could be employed for the coops during the early periods of the year. Under such conditions the chicks could run about quite freely without any risk of undue exposure, and, as it was open on two sides, they were practically, so far as atmospheric influences were concerned, in the open air. When the first batches of

ground should be given as far as possible, and hence the recommendation that, if the birds cannot be removed on to new soil, this latter shall be brought to them. Therefore, in chicken-houses such as have been named it is desirable to put down a good thick bed of fresh earth from time to time. Where we are rearing by means of coops, and there is a choice of land, no plan can be better than to put them out upon ploughed fields or broken ground; for here it will be evident that the birds can obtain a large amount of natural food, and the exercise in seeking for that is most helpful in development. When only a few birds are to be reared, there is not much difficulty in giving plenty of liberty; it is only when the area is restricted, or large numbers are to be bred, that they must be kept within confined runs. Our experience has shown that, whilst chickens raised either in coops or brooders should be kept confined for the first ten days or fortnight, after that time the more of freedom that can be given, the better. More loss is caused by restriction than by full liberty. The sense of confinement is harmful to all

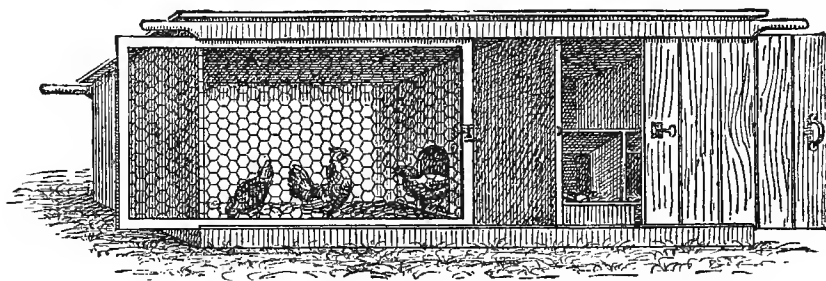


FIG. 48.—PORTABLE CHICKEN-HOUSE.

chickens do not come out before March, then a special house is unnecessary, for the coops in which the hens and chicks are placed provide sufficient shelter; but as a rule it is inadvisable to attempt the rearing of chickens in December and January in the open. We believe in bringing up chickens in a hardy fashion, and are very glad to note that there is a reaction against the pampering methods which have been in vogue for some years, and which have been the means of inducing a very serious amount of disease amongst our poultry. We do not mean that chickens should be put out in coops during very severe weather, as that would be folly and courting disaster; but later on it is much the better plan to allow the birds to rough it a little, and be exposed to the variable weather of our springtime. Fresh air is essential, and in the spring all living things are reproducing themselves, so that we are falling in with natural conditions.

One disadvantage which chicken-houses have is that the runs in front cannot be changed. During the ordinary period of the year it is necessary that fresh

growing creatures, and arrangements should be made whereby the chickens at any rate can wander as they think fit.

COOPS AND COOPING.

In former times, when only two or three batches of chickens were raised upon a farm during the year, suitable provision could easily be made for them. Under these circumstances the hens did not require cooping, as they could be accommodated in any out-building, and allowed to wander where they like. With the extension of the work, however, it becomes necessary to coop the birds for various reasons, affording the inmates protection, and sheltering them against adverse influences. Moreover, if a large number of hens with their broods are in one field, there would be great danger of their fighting with one another, and also of injury to the chickens. We have often noticed that if a strange chicken wandered near a hen she would attack it, and this must be provided against. It would be impossible to keep, say, fifty lots of chickens

in one field of two or three acres if the hens were all at liberty, but with coops that is quite easy to accomplish.

Many different kinds of coops are made. The requirements of a coop are that it shall give shelter to the inmates, be warm and comfortable, affording protection from marauders at night, and be easily removed. If to be used in the chicken-house, as described in the last paragraph, the shape is of small moment. A bottomless box, with wooden laths or wire bars in the front, will answer just as well as anything else. But if it has to be put out in the open, then there must be something very much stronger, offering more protection, both against weather and the enemies of chickendom.

Amongst the earliest forms made was the ordinary Sussex coop, which at one time was almost universally employed. It is triangular in shape, and presents at front the appearance of an inverted A. This generally stands about 24 or 27 inches high in the centre, and is the same width at the ground. The sides and back are solid, but the front is made of upright laths, one of which is loose, so that when raised the hen can get out. Of course the laths, as in all coops, are sufficiently apart to allow the chicks to pass between them. This coop usually has no floor, but in such dry districts as Surrey and Sussex a floor is not needed in any coop. Wherever the ground is at all damp or cold, a floor is indispensable in a coop, of whatever kind it may be. This coop may be regarded as old-fashioned, but it is none the worse on that account. Its chief fault is that the front does not give much space for a shelter flap being fitted thereon—an almost necessary part of it either on wet or sunny days. A wire run, of course made the same shape, can be fitted to the coop. Mr. Calway makes a very good coop of this kind (Fig. 49), without run, and those who wish to buy rather than to make their own will find two or three kinds in the price list of that firm.

A second kind of coop is built square (Fig. 50), and may have either a roof sloping from front to back, or be gabled, either of which forms answers equally well. The size depends upon the hen, but we have always found 21 and 24 inches square the most useful sizes. All coops should have solid sides and backs, and the design will not in any way affect that arrangement. The front should be formed of wire bars or wooden laths. If the former are employed, all but two should be fixed in the upper and lower frames; but these two (those in the centre) should be rather longer than the rest, and in one piece, the bend being on the top to form a handle. The ends of this long Π will come to the bottom frame, and should be fixed into a loose piece of wood long enough to nearly touch the next bar on either side of these two, thus forming a door for the hen; that is, if each bar is 2 inches apart, the piece of wood should be $5\frac{3}{4}$ inches long. A piece of

tin carried loosely round the bar, and then tacked to the wood at each end, will keep the door in position, and prevent the hen making her way out when not wanted. If wooden laths are used, it will be sufficient to make the centre one longer and loose, and then it can be lifted right out. A flap should be made to fit at top of the front for shelter, and be arranged to be flat or at an angle, and another may be placed at the foot to close up at night—though if a wire run is employed this latter is not needed—for then cats or other night marauders cannot find their way in, unless the run be very loose. This ought never to be, for sometimes the chicks get out when that is the case, and cannot return again.

We have mentioned that sometimes a floor is necessary because of the nature of the soil. When this is so, it is important that it be properly made. A fixed floor to a coop is very bad, as it absorbs the damp from the earth, making the hen and her brood cold and uncomfortable, giving rise to colds and other diseases. Not only so, but a fixed floor cannot be cleaned pro-

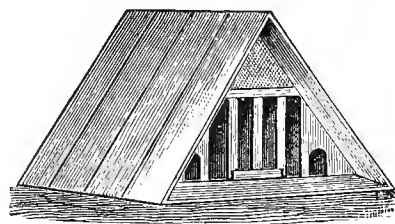


FIG. 49.—SUSSEX COOP.

perly, and on that score is very objectionable. A floor should therefore be movable, and be raised 2 or 3 inches above the ground. The best method is one that we adopted years ago, and it is, in our estimation, perfect in every way. The boards forming it are nailed on to a couple of pieces of 2 inch scantling, and fit entirely within the coop, the sides resting upon the scantling. In this way the inside of the coop is kept perfectly dry, for however hard the rain comes down it cannot splash within. When it has to be cleaned, lifting the coop leaves the floor lying so that both parts are at once accessible for cleaning. Another advantage is that the coop can be used with or without the floor, as the time of year and season may make desirable. Where the ground is sufficiently dry we prefer not to use a floor, but where one is used the boards should be kept well covered with dry earth and straw. A coop should be limewashed out between every brood's occupation of it, or insects will become a source of trouble and annoyance to both hen and chickens. The hen should always be let out for a short time every day, and be placed where she can enjoy the luxury of a dust bath, as this is necessary to keep her healthy and her progeny free from parasites.

DOUBLE COOPS.

There are many parts of the country where it is possible to place coops out in the open even in winter, except when the ground is covered with snow or hard with frost, especially if natural shelter is available. But to do this a suitable coop is essential. The ordinary form already described does not afford sufficient protection, as the shelter from wind and rain is insufficient during unfavourable weather. Fig. 51 is a decided improvement on the ordinary form, affording side-protection. A much more perfect coop is that illustrated in Fig. 52, which consists of a coop and run combined under the same lid or roof. This should be 4 feet long, 21 inches deep, and 24 inches high in front, sloping down to 18 inches behind. It should be solid on top, back and end, and, if fitted with handles as shown, it can easily be moved from place to place. The lid should be hinged at the back and divided into two portions, one to open over coop and the other over run. The inside has two compartments, one 21 inches

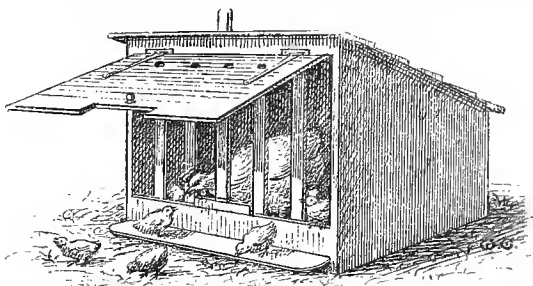


FIG. 50.—SQUARE COOP.

square, forming the coop proper, which may be fitted with floor or not, in accordance with the nature of the soil, and the other a covered run, separated by means of a barred partition, so that the chickens can pass through whenever they desire to do so, but the hen is kept in her own place. This plan is very useful during feeding-time, as special food can be given to the chicks without the mother sharing in it. It is a good plan to make this partition either to open or slide out. By the arrangement named it will be seen that the run will be 27 inches long by 21 inches wide. The coop should have a solid door, but with space for ventilation at top, in front of the sleeping section; but the run must be barred, giving the chickens perfect freedom of egress whenever they wish to come into the open. Of course, the door to the coop must be made to open, so that the hen can come out also if it is desired for her to do so. The great advantage of such a coop as is here described is that perfect shelter is afforded to the inmates, which have at the same time the benefit of perfectly fresh air. If placed with its back to the wind or rain, the

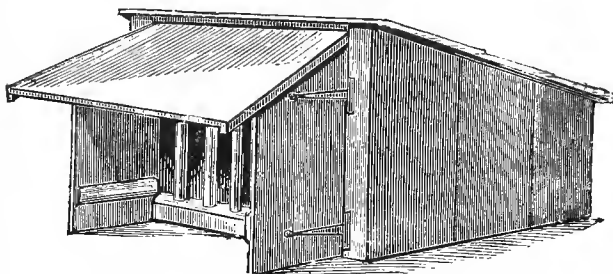


FIG. 51.—SPRATT'S PATENT SHELTER COOP.

otherwise, the young chicks sometimes wander and cannot find their way back again.

A most important point in the management of chickens is that the coops be moved on to fresh ground every day. Nothing will more speedily taint a piece of ground than a brood of chicks, and to keep them in health it is desirable that they be given sweet soil to run over. This is most difficult when a large number of coops are being used or the ground is very limited.

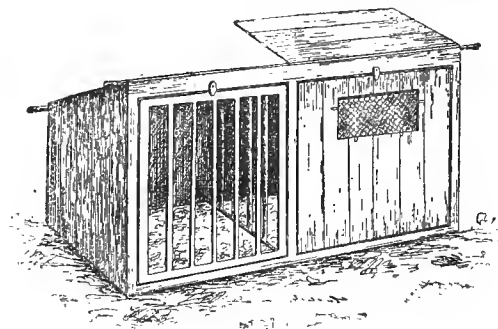


FIG. 52.—DOUBLE COOP.

The former is not difficult to overcome, and it is sufficient to remind readers that the same space should not be again occupied within less than a week. Where chickens are reared on a very restricted area, and it is impossible to move the coops, fresh ground should be brought to them and laid down. A grass sod may be given for the birds to scratch about, benefit being obtained both from the natural food contained therein and the exercise obtained in securing that food.

CLEANLINESS ESSENTIAL TO SUCCESS.

It is scarcely necessary to refer to the importance of cleanliness in the hen-coops, feeding-dishes, etc. But, lest anyone might think that is non-important, we desire to remind the reader that want of attention to this point will be fatal to success. The coop ought to be thoroughly cleaned out every day, to have fresh soil placed in it, and the straw be renewed twice or thrice a week. These, with a good limewashing after each brood has been removed, should keep down insects, which are so prolific a source of trouble. Fowls can never thrive when infested with insects, and the disease known as gapes is due to worms in the throat, which worms are in many cases developed from parasites found on the birds. We have always been very free in our use of disinfecting-powder, both in the coops and hen-houses, as it is the best preventive of trouble with insects that can be obtained. But it will not do all, and together with its use there must be perfect cleanliness. Some arrangements should be made whereby the hens with chickens can have a good dust-bath every day. In the summer time, if at liberty, they can secure that for themselves. Some breeders have adopted the system of anointing the heads of chickens with an ointment made as follows: Mercurial ointment, 1 ounce; lard, 1 ounce; powdered sulphur, $\frac{1}{2}$ ounce; crude petroleum, $\frac{1}{2}$ ounce. This preparation is warmed to semi-fluidity, well mixed, and the heads of the chicks anointed with it as soon as they are dry after hatching. The effect is that the insects will not remain on chickens so treated.

PARASITES IN THE CHICKEN-HOUSE.

The importance of this branch of the subject deserves careful attention, as very many chicks are lost through inattention to what is a detail in management. No bird or animal can possibly thrive if troubled with vermin, the irritation being a sufficient hindrance. The first thing is, of course, to see that the house or coop is well whitewashed out and kept thoroughly clean. Even at the risk of repetition, we must again urge frequent coats of whitewash to be put upon the houses, and if some carbolic acid, say a breakfast-cupful to a bucketful of wash, be mixed with it, or of solution of permanganate of potash, that will go a long way to keep down insects. Coops should have this applied every time they are used for a fresh brood, chicken-houses once every month, and ordinary fowl-houses once or twice a year.

It is scarcely necessary for us to say anything further about the importance of the dust-bath, both for the sitting hen and broods, but it must at the same time be remembered that the chicks almost always obtain fleas from the hen; and it is found that birds hatched in an incubator and reared by an artificial mother are less subject to gapes than those brought out and reared

in a natural way. But it is also important to see that the chicks have a dust-bath provided, as they begin at an early age to enjoy it if given to them; at any rate, this should be done when they leave the hen, but earlier is to be preferred.

The best way to discover if the birds are troubled with lice or fleas is to examine them on the heads and under the wings and thighs, when the parasites will easily be discovered. As soon as the chicks are seen to be moping or a little out of condition, this examination should take place, and many chicks would be saved in consequence. So much importance do some poultry-breeders attach to the question of insects that they always apply mercurial ointment to the head and under the wings and thighs a few days after the chicks are hatched. This is, perhaps, a rather strong remedy, and we think that dusting the birds with flowers of sulphur, mixed with an equal quantity of carbolic or insect powder, will be sufficient. The hen, also, must be examined and treated in the same way, or no good will be done, as she will communicate the pests again to the chicks. After they have been dusted, put them in a pen by themselves for an hour or two in a stable or outhouse, and afterwards pour boiling water over the ground to thoroughly destroy the insects.

The following treatment is recommended in a valuable leaflet (No. 57) issued by the Board of Agriculture and Fisheries: "Regarding the infestation of the birds themselves, white precipitate seldom fails. The heads and necks of young chicks should be early dressed very sparingly, and repeated when necessary. White precipitate is a strong irritant poison, and needs the greatest care in its use, especially in young chicks. It is best obtained as an ointment from the chemists. Hens selected for sitting should have a small quantity of this ointment rubbed in under the vent, head, and sides, and then be well dusted with insect-power (*pyrethrum*). Sitting hens are greatly tortured by parasites, and their young are often lost by neglect of these simple precautions. Dust-baths are the natural remedy for lice and mites, and fowls should never be kept without them. Sand and road-dust, mixed with a small quantity of paraffin, will generally keep the birds free from vermin. In place of paraffin *pyrethrum* powder may be used with the dust."

Such enemies to chickens as rats, cats, and mice must be fought against in a sterner fashion, and traps are, perhaps, the best things to use. It is a good plan to train a kitten up to be accustomed to the birds, and it will in time be a protector to them. Rats are especially cunning, and require more than ordinary skill to overcome. They often kill both hen and chickens.

EARLY DAYS OF CHICKENHOOD.

For the first twenty-four to thirty-six hours after a chicken is hatched, it needs no other food than has been provided for it by Nature. The yolk-bag, which is

absorbed into the abdomen prior to the breaking of the shell, contains all the food needed for the time already stated. We believe harm is often done by forcing young chickens to eat, and it is not improbable that derangements of the stomach are set up by so doing, especially as rich food is often given. When the proper time comes, there will be no need to force eating. The cravings of Nature will remove all necessity for that. But the hen ought to be well fed, and when the anxiety of her maternal trial is over, she will be ready for and need something calculated to brace her up again. Mons. Van der Nicket of Brussels declares that chickens at liberty can go four days before any food is supplied, and will be much more vigorous than if fed before, but we have never risked such an experiment.

FEEDING CHICKENS.

The whole question of feeding young chickens deserves the fullest attention, as upon it will largely depend the future of the birds. As already stated, there has been a revolt against pampering, but it is necessary to avoid going to the other extreme: one would be just as bad as the other. The plan which we have adopted for many years has been to feed, after the first twenty-four hours, for three or four days upon hard-boiled eggs and bread-crumbs, slightly moistened with milk; but we are bound to confess that we have seen chickens reared without the egg quite as successfully as with it. After the third day of egg-feeding we have been accustomed to give alternately for the next fortnight Spratt's chicken meal, oatmeal, and boiled rice, all properly prepared by steeping or cooking. At the period named the boiled rice was given very seldom, and broken wheat or buckwheat, or in some cases crushed groats, were added to the diet. Our experience has been that this system, properly carried out, yielded in the great majority of places the maximum of results when rearing took place under hens; but it was not found nearly so satisfactory when brooders were employed. In the next chapter mention is made as to the difficulties which arise when rearing artificially, but we may at this point give the results of our experiments in connection with the dry method of feeding.

THE DRY SYSTEM OF FEEDING.

In connection with the College Poultry Farm at Theale, in order to meet the need of students, we are compelled to hatch to a considerable extent at all seasons of the year, and the rearing has been a great difficulty with us, due to the fact that Theale lies upon low ground in the Kennet Valley. We are surrounded by hills on all sides, and although the land is favourable and we have a fair amount of shelter, during the colder months of the year we have morning fog, and also less sunshine than places which are only a short distance away. These early mists and the consequent dampness have been our chief difficulties. Chickens

that were sent on to the hills gave a much better percentage of results than when we attempted to rear in the valley. Of course these natural difficulties are especially hard to combat.

As mentioned previously, at Theale there are several scratching-shed houses, and for birds which must necessarily be kept in a measure of confinement we believe that this system embodies the future development of poultry-keeping to a very large extent. It is natural for the organs of the body to be used as much as possible, and our experience has been that hens which have to work in this way for their living lay better and are healthier than if they are fed without giving them anything to do, as is often seen with birds in confinement. The latter system may be desirable when the birds are to be killed off, but not when they are to be kept as laying machines. It was this fact which led to the adoption of the scratching system in connection with the rearing of chickens. The chief trouble which we had in rearing was seen in an inflammation of the bowels, leading to diarrhoea or dysentery, and in some cases the lungs also were greatly affected. We need not describe the affection further, because most of those who have attempted to rear chickens in the winter season have had similar experience. It would appear that this trouble was due either to dampness or to want of exercise, because the same food was employed as at other periods of the year and under other conditions, when it was most successful. The lack of exercise, however, seemed to make the birds more subject to chill, and thus the dampness would affect them to a greater extent. The plan we have adopted is as follows: Our large brooder-house has the floor littered to a depth of several inches with cut chaff; in the open-air brooders we have fitted floors to the covered runs—to make that were suitable, and in the covered runs of double coops (Fig. 52)—upon these floors placing cut chaff. Consequently, for the first few weeks during the winter period the chickens are not permitted out upon the ground except when it is fine, dry weather, and thus there is not the danger of chill or of dampness which would otherwise be the case, and which undoubtedly has been our great difficulty. It is not natural to rear them in this way, but the whole system may be designated as unnatural. So far as the feeding is concerned, the main idea is that the birds shall have to work for their living, and the food must be to a large extent grain or seeds. The food is largely seeds and small grain, and below we give the dietary. All the time grit in abundance is thrown amongst the chaff, and it is surprising the quantity of that material the birds will consume. Of course, grit is an absolute essential, otherwise they would be unable to digest the seeds and grains. In addition there is supplied plenty of water, which should be given fresh two or three times a day, and an

abundance of green food—lettuces or young cabbages. In fact, success hinges largely upon the green food supplied. The birds consume a very much larger quantity of water than would be the case if they had principally soft food.

The point to consider is that the chickens, after their morning feed, cannot possibly secure any of the seeds without working for them. These all fall to the bottom of the chaff, and the chickens scratch to find the seeds; in finding one they cover up another, and so on all day. It is no question of being fed so many times a day, because they are always eating and always working. Certainly the results have been remarkable, in spite of very unfavourable seasons. The percentage of loss during the seasons that the system has been tested has been infinitesimal. The system here recommended is not in any sense cheaper than the old method, and unless care is taken it may be considerably dearer; but with us it was rather a question of growing a fair percentage to a killing age. Judgment has to be exercised in supplying sufficient food without giving too much. The chaff needs to be renewed about every ten or fourteen days, oftener if the number of chickens is considerable. When taken away, it is a very excellent plan to throw the chaff into the scratching-sheds for adult fowls, and they will generally find something there that is worth working for. But dry feeding alone is not desirable. We have found that the best results have followed with us, when a proportion of soft food, as shown below, is given after the second week, otherwise the chicks make slower progress.

The following is the dietary which has proved most successful under this system :

First fortnight: Millet, dari, buckwheat, canary-seed in equal parts, and granulated meat.

Second fortnight: Spratt's meal, cooked rice, or oat-meal, dried off with ground oats, adding a little bone-meal and 15 per cent. of meat as morning feed; grains as above, with broken wheat added at other periods of the day; we gradually reduce the canary-seed.

When a month old: Abolish small seeds and add cracked maize.

When six weeks old: Barley-meal, toppings and meat, mixed and given warm in morning; whole wheat, barley, oats, and cracked maize; green food all the time.

A word of warning is necessary where it is intended to fatten the chickens. Under these circumstances they should be fed largely upon soft food after they are a month old; otherwise the crop will not be expanded enough to enable them to bear the cramming during the final stages—that is, to hold sufficient food for the best results. (*See Appendix F.*)

SPACE FOR CHICKENS.

The amount of space given to the chickens must depend largely upon how much is at command. The

ideal manner of rearing chickens is to place the coops out in a well-sheltered place—sheltered to the north and east, but open to the south—and allow the hens to go about where they like, of course arranging that the coops shall be well apart. Where foxes and other pests of the poultry-keeper do not abound this is a good plan, provided that the hens are accustomed to full liberty; then they will only go as far as their chickens can stand, and the whole arrangement is a beneficial one. But if the hens are usually kept in confinement, to place them out in the open in this manner would be most disastrous, for the old birds would so enjoy their liberty, and be thinking of their own pleasure to such an extent, that the poor chickens would have their strength overtaxed. Many are lost in this way, and where the hens are usually kept in confinement it is desirable that they be restrained when in charge of chickens. There is also another point to be mentioned here—namely, that the habits of a hen and her brood must be regarded. For instance, if a hen is set upon eggs laid by herself, or by hens of her own breed, she is not likely to overtax them so much as if of different breeds. If it is her nature to wander, the chicks will have the same leanings. But if, say, a Game hen is put with eggs from chickens of any other or less active race, the probability is that, if given her liberty, she may lead them too far astray, and thus overtax their strength. These are matters which must determine the question of how much space should be given to the chickens, and if the happy mean can be secured all will be well. Theoretically, it is desirable to give the chicks as much space as possible, but there are certain limitations indicated above.

THE ORPHANS.

As a rule, when young birds are about six to eight weeks old the hen becomes restless and neglects them. She and they must be watched about this time, or the result may be disastrous. So soon as she is seen to be leaving them, it will be better to remove her to the laying-house again, and make some other provision for the orphans. What this provision will be must depend upon the season of the year, and, to a certain extent, the nature of her chickens. If the weather is warm, and they are of a hardy race, they may be put at once into one of the special houses similar to those shown in Figs. 16 and 48. In this case it will be desirable to provide special perches, for bent breast-bones would result if they were allowed to roost on ordinary narrow perches. These special perches should not be less than 6 inches broad, and have the edges carefully rounded off. At one time we used broad shelves, but the 6-inch perches are in every way as good. Some breeders do not permit their chickens to roost on perches until they are well grown, but make a thick bed of sand or straw on the floor. The objection to this is that so

near the ground is generally draughty, and colds may not improbably be the result. In very cold weather, or in the case of delicate varieties of fowls, it will be necessary to provide more shelter for the deserted chickens, and for this purpose the best thing is what is known as a cold mother. This is a frame upon which canvas is stretched, and the canvas is lined with flannel, or flannel strips are suspended therefrom. The frame can either have end-pieces the required height to keep it from the floor, or it may simply rest upon bricks or blocks of wood. The size and height must be regulated by the number and age of chicks which are to be accommodated. Chickens will nestle under, and they will be much warmer than if they were on perches. A cold mother seems to be a necessary part of the equipment of every poultry-yard where the raising of chickens is regarded as an important work. As a rule, the birds will not need to be kept in the mother for long, and it will be to their benefit if removed therefrom as soon as the weather becomes at all warm.

DIVISION OF THE SEXES.

The division of the sexes is a duty which many breeders delay too long. In this matter it is not at all easy to define a time when it must be done, for the breeds differ much in rapidity of maturity. We have always regarded the proper time for separation as soon as the little cockerels attempt to crow. We do not mean that if some cheeky, precocious fellow makes a vain attempt at five or six weeks old the division should then be made, but that as soon as the crowing becomes pronounced separation is necessary. It is better to err on the side of early than of late division. In the lighter breeds the chicks are usually ready at ten weeks, and in the heavier varieties two or three weeks later.

THE SALE OF YOUNG CHICKENS.

Of late years a new business has sprung up, namely, the selling of early hatched chickens to farmers and others who have not the means of bringing out early breeds themselves, or prefer to buy them ready hatched. It is true that there had been for many years a certain amount of business done in this direction. For instance, in the Birmingham district it has been a common practice to sell hen and chickens in a brood, and a very large trade is done in this way, but as a rule not until after the first of May. For the production of early chickens incubators are a necessity, and it would be impossible for the trade to develop to any extent unless such machines were available. The securing of a sufficient supply of fertile eggs, as will be realized, in many places would be a considerable difficulty. Starting in January, if anyone had incubator accommodation for, say, 1,000 eggs at one time, he would require between January 1 and May 31 at least

7,000 eggs to keep the machines going, and if handled upon a fairly large scale, a good deal of organization would be necessary for securing these eggs. Then comes the question as to breeds, because the returns will depend in some measure upon the class of chickens offered for sale. If these were mongrels, with no certainty that they would make good table chickens or layers, the prices would naturally be comparatively small, and no one would expect to obtain more than about 5s. to 6s. per dozen for such birds. That should leave a fair margin of profit, although the cost of the package has to be reckoned; but at the same time pure breeds would cost no more to produce—except in so far as the outlay for the eggs was concerned—and should yield better returns. An examination of the poultry papers will show that for pure-bred chickens a day old the prices vary from 6s. to 21s. per dozen, being, of course, more expensive early in the season than later on. If the chickens are vigorous and of good strains, these prices are by no means unreasonable, and it must be borne in mind that chickens are actually bought, and not, as in the case of eggs for hatching, the probability of obtaining them. We do not think that this trade is at all likely to develop amongst what may be termed fancy poultry; it is purely utilitarian, and it is in that direction efforts should be put forward.

There are several considerations which anyone who is going in for this branch of poultry-keeping would do well to regard. For such work it is necessary that the eggs should be from vigorous stock, otherwise there is great danger of customers being dissatisfied with the results. When the hatcher sells the chickens, his responsibility is naturally at an end, because he cannot in any sense be held to account for the method of rearing, of feeding, etc. At the same time, it is to his interest to send out hardy birds that will under normal conditions rear successfully. This has been done in multitudes of cases, and we know instances where several thousands of these newly-hatched chickens are sold every season. That the trade is a growing one is evident from a glance at the columns of the regular poultry papers, where the advertisements are becoming more and more numerous. One difficulty which we have met with arises where the hatcher is not the owner of the fowls producing the eggs. With his own stock and reasonable care, he can insure that his customers, in the case of pure breeds, receive chickens absolutely of the variety ordered; but if he is dependent upon others for the eggs, then there must be a greater amount of risk. For instance, if he buys a large number of eggs stated to be from Buff Orpingtons, he has no guarantee that this is absolutely the case; there is a measure of guidance by the colour of the shell, but that is only to a certain degree. Hence under these circumstances he must be prepared for a number of complaints. We must urge him, however, to take all reasonable pre-

cautions in defence of himself and his customers. It is needless to say that the success of such an enterprise as this will depend a great deal upon management and upon a clear understanding as to the proper methods of working incubators.

The question is, when the chickens should be delivered, and here the result of long experience has shown that when they are properly dried and have recovered from the strain of hatching, which will be in about twenty-four hours after emergence from the shell, is the best time to send them away. They should be packed in good wooden boxes (Fig. 53); these need not be large, as for a dozen chickens a box about 14 inches by 7 inches is quite spacious enough. The box should have at least 8 or 9 inches of head-room, and be plentifully supplied with ventilation holes above the heads of the chickens. It is better to nail a piece of sacking over the top rather than a wooden lid. The inside should be well littered out with cut chaff, and to provide the chickens with food, if the journey is a long one, we should recommend that in the

cut chaff there should be scattered some canary-seed, dari, and hemp-seed. The chicks will scratch about for it if the place is fairly light, and thus keep themselves warm as well as obtain the necessary support. Two or three bunches of green stuff, such as lettuce or young cabbage, should be suspended inside

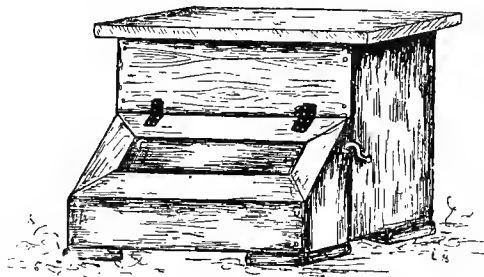


FIG. 53.—TRAVELLING CHICKEN-BOX.

the box, if the journey is a very long one, as the chickens will eat this very readily. Chickens so packed, even despatched at the early age named, have been known to travel hundreds of miles without loss. What is necessary, however, is to consider the time of year. We should deprecate the sending of young chickens in this way during very severe frosts, especially if they had to make

a cross-country journey, where there would be danger of exposure at railway-stations. The boxes should be well made, and if the weather is unfavourable a piece of sacking nailed on the outside would add considerably to the warmth inside. The box should be well labelled, and have on top, "Live Chickens; this side up, with care." A cord across the top for a handle would facilitate moving and ensure safety.

CHAPTER XIII.

ARTIFICIAL HATCHING AND REARING.

EGG-OVENS OF EGYPT—WESTERN EXPERIMENTS—HYDRO-INCUBATOR—ARE INCUBATORS PRACTICAL?—USE OF INCUBATORS—INCUBATOR-HOUSES—TANK INCUBATORS—HOT-AIR INCUBATORS—SELF-FILLING LAMP—MANAGEMENT—MOISTURE—GENERAL HINTS—BROODER-HOUSES—BROODERS—GENERAL HINTS—DIFFICULTIES IN REARING—HARDENING THE CHICKENS.



ARTIFICIAL incubation has fascinated many minds for several centuries, and those who object to the adoption of this system may perhaps be surprised to learn that for nearly 2,000 years the artificial system of hatching and rearing has been followed in Egypt, China, and other Asiatic countries. The Egyptian egg-ovens offer the most striking example of what can be carried out in the modification of natural methods. It has been stated that there are at the present time in Lower Egypt several hundred of these hatching establishments, and that in some cases they have a capacity for 40,000 eggs at one time. A few years ago the American Consul-General in Egypt estimated that upwards of 90,000,000 chickens were hatched annually in the egg-ovens of that country. No useful purpose would be served in giving a description of these ovens, which are evidently of a most primitive character, and depend upon the skill of the operator to a remarkable extent. The operators are members of families who have carried on the work for centuries, and hire themselves out to the proprietors for the hatching season. In the ovens no effort seems to be put forward to secure ventilation or regulation of temperature, and heat is engendered by the burning of dried camel dung on shelves above the eggs, the latter being placed in heaps upon the floors. We have endeavoured from time to time to obtain some reliable figures as to the percentage of hatching, but without success. In one case, however, we were informed that the loss of eggs by death in shell was enormous, amounting frequently to as much as 60 per cent., but upon that point we have no reliable information.

The first records with which we are familiar as to any attempts in Western Europe are contained in a work written by Mons. de Réaumur, of the Royal Academy of Sciences in Paris, the English edition of which was published in 1750. Mons. de Réaumur tried many methods,

including the Chinese system of hatching by means of dung, obtaining the necessary heat from decomposition of that material. The results were not encouraging. During the last century many attempts were made in this direction. At the first great International Exhibition in 1851 an incubator was exhibited, made by Mons. Cantello, and which commanded a large amount of attention. It was on a large scale, and the inventor, believing that the heat was communicated to the eggs by the actual contact of the hen, used indiarubber on the lower side of the tank, it resting upon the eggs. The machine did not command any amount of success, and soon passed into oblivion. Many other attempts were made, and the first of which we had personal experience was the "Boyle" incubator in 1877—a most ingenious machine, but far too intricate and expensive. A little later a smaller machine was patented on the Cantello principle, but from want of an efficient method of regulation, in which the "Boyle" was almost perfect, and from the fact that large numbers of the chicks hatched were crushed by the weight of the water and the sagging of the indiarubber, it did not succeed. These and other machines were far too intricate, cumbersome, and costly, and it was not until the year 1878, when Mons. Rouillier, now Principal of the French School of Aviculture at Gambais, introduced his hydro-incubator, that this system of hatching became at all practical. The machine named, which is still used to some extent in France, had no lamp or regulator, the heat being maintained by the removal of a portion of the water in the tank every twelve hours, and the substitution of a relative quantity of boiling water. Although under these conditions fine regulation was impossible, we hatched very successfully with it. The trouble involved, however, was considerable. Modifications of this machine were made, but it is not too much to say that the introduction of the "Hearson" incubator in 1883 made the adoption of the system

possible to a degree not known previously. Mr. Hearson's invention, which is fully described later, was in all respects a remarkable advance upon anything that had gone before, and brought the system within the compass of poultry-keepers of every grade. To Mr. Hearson poultry-keepers in all parts of the world owe a great debt, and his invention has extended the opportunities of poultry-keepers to a degree never yet fully recognised.

ARE INCUBATORS PRACTICAL?

Within the past few years the increase of artificial methods of hatching and rearing chickens has been enormous. It is always the case when any new method is introduced, that for a time progress is comparatively slow, and it is a considerable period before people will abandon the systems to which they have been accustomed. This, probably, is especially the case where the change involves the substitution of artificial for natural methods. When incubators were first brought out they were very unreliable, but the experience gained, and the increase of knowledge as to the opportunities underlying this system, have led to a realization of the importance of hatching by other than the natural methods. Much of the increase of use, however, is due to the undoubted growth of the poultry industry in this country, and it has been found again and again that those who were more progressive and adopted the newer methods succeeded where others had failed. Thus, the laggards have been compelled in self-defence to follow in their footsteps. The use of incubators at one time was practically confined to fanciers and amateurs, and to a few of those who kept poultry for profit, but this is no longer the case. Instead of being a fad on the part of the few, artificial hatching is now a practical necessity. We have been astonished to find how extensively incubators are employed, and the sales recorded by some of the makers of these machines show that the demand is rapidly increasing.

The great advantage offered by incubators is the increase of power on the part of the breeder. Instead of being limited in his hatching by the vagaries or natural instincts of his hens, he is now in a position to hatch at almost any season of the year. It has been explained previously that one of the results of our breeding during the past twenty years has been to reduce the supply of broody hens, owing to the development of egg production. This in itself is partially the result of the introduction of artificial methods, because breeders dare not have bred for egg production to the same extent if they had been compelled to depend upon hens alone. But the use of incubators has been enormously increased from this fact, and also the wide dissemination of the non-sitting varieties. To use an American expression, there can be no question that incubators "have come to stay,"

and it is difficult to realize what our position would have been without them. Nor are incubators used in isolated instances, and many of those who read these pages would be surprised to find the number of machines which may be at work upon one place. Poultry-breeders with six to ten incubators are common, and there are a few instances where from twenty to sixty are now in use at one establishment.

USE OF INCUBATORS.

Believing as we do that the future of the poultry industry in this country largely depends upon the adoption of artificial methods of hatching and rearing, it is desirable to indicate our reasons for that opinion. The irregularity of hens at other than the ordinary season has been a frequent complaint, for not only are they uncertain as to when they will become broody, but there is always a certain amount of risk that, should the weather become suddenly colder, they may desert the eggs, which is a very serious matter early in the season and with valuable eggs. Moreover, every hen has to lay a number of eggs before she evinces any signs of broodiness, and these may be more valuable as potential chickens than for marketing purposes. But it is impossible to use them unless other hens are available, or we have an incubator. By machines we can hatch at any season of the year when fertile eggs are to be obtained, which is an important consideration for early chickens and pullets intended to lay the following winter. A further recommendation is that with the great increase of non-sitting varieties of poultry, and the gradual elimination of those breeds which set early and often, because they are not profitable, breeders find sitters scarcer every year; many of the most popular varieties, even though they are sitters, by reason of having been bred to develop production, are comparatively late in becoming broody. We do not want, however, to dethrone the hen from her position. The better plan is to use both systems. Until hens are ready to commence work, we must depend upon incubators; but so soon as they show the instinct, then it is desirable to take advantage of it.

It is often suggested that chickens and ducklings hatched in machines are not as hardy as when obtained in the natural manner. That it may be so cannot be questioned. Results must depend upon the incubator and its management. Given a good machine well managed, no real difference can be seen, and there are those who believe that any advantage to be found is in favour of the artificial system. In this connection we may remind readers that there is a great difference between an animal and a bird in the methods of reproduction. The former retains the embryo during its stages of development, only giving it birth when fully formed, whereas the final stages in the latter take place after the egg is laid. A hen has only to afford the eggs sufficient heat, to select a suitable place for

the nest, and to turn them as often as her instinct teaches her. Given the same conditions artificially supplied, there is no reason why results should not be as satisfactory. In practice it is certainly found to be so.

A theory has been advanced of late that chickens hatched by artificial methods lack something which is imparted to the egg by the hen, and the fact is cited in support—which must be obvious to all observant poultry-keepers—that the shells of eggs under hens are coated with a very fine film of oil. The suggestion made is that this oil imparts a degree of vigour to the chick which cannot be obtained when artificial methods are employed. Such a suggestion has met with a considerable amount of opposition. Discussing this question with Mons. Van der Sniect of Brussels, a gentleman whose knowledge of natural science, especially as applied to poultry and smaller stock, is perhaps the greatest of any man at the present time, he informed us that in Belgium the reason why artificial methods of hatching have not been adopted by the peasants is that they strongly hold the opinion here expressed. He stated that it is a common practice on the part of Belgian peasants to kill a fat old hen and to rub the eggs over with part of her fat, even when they are to be covered by hens. Upon this point, however, we have no definite information, and cannot do more than simply mention the theory as put forward.

INCUBATOR-HOUSES.

The increase of artificial incubation has developed the need for arrangements, where this work is carried out upon a large scale, suitable to those conditions. In many places where only one incubator is used, it is not at all difficult to make arrangements so that the machine shall be kept quiet and supplied with the attention and management it requires. But if we multiply the number considerably, it then becomes necessary to make other arrangements. It is easily understood that, if only one incubator is at work in a room, the amount of influence upon the atmosphere by the burning of an oil-lamp for maintaining the temperature would be comparatively small, but if there were a dozen incubators the exhaustion of oxygen would be very rapid indeed. Hence experience has shown that, unless great care is taken in this direction, there is danger of the results being less satisfactory when operations are upon the larger scale. That is so, however, in all departments of life; what can be done on a small scale does not necessarily follow when the amount of work accomplished is greatly increased. In America poultry-breeders have of recent years largely adopted the system of incubator cellars, as they are called, the greater part of which is underground, but that system has not been found necessary in our own country. We must bear in mind that in America the winters are very much colder and the

summers hotter than with us, and these incubator cellars have been devised specially to counteract the extremes in one direction or the other. There can be no question that for one or two machines, and in the absence of a special house, a cool, sweet cellar is one of the best places for incubator work, by reason of the fact that it is cooler in summer and warmer in winter than an ordinary building above ground. In many cases, unless they are specially built, ventilation is bad, and there is frequently a close smell which betokens impurity of atmosphere.

THEALE INCUBATOR-HOUSE.

In this connection we may be permitted to describe an incubator-house which has been erected at the poultry farm in connection with the University College, Reading, and particulars with regard to it may be of service elsewhere. Our experience was that in the buildings originally used for the incubators we could obtain excellent results with a small number of machines, but when we made an increase difficulties arose. As a consequence this house has been designed, and it has certainly proved of very great service. The accommodation in the house is for twelve incubators, although there is sufficient room to place other four should they be required. The house (Fig. 55) is 32 feet in length by 16 feet in width, divided into two sections, one 27 feet by 16 feet, and the outer room or porch 5 feet by 16 feet. The whole stands upon concrete foundations with a floor of Staffordshire tiles, so that it is solid and firm. The walls are 8 feet 6 inches in height at the eaves, rising to 11 feet at the apex of the gable, and the walls are made of double boarding, the wood employed being red deal an inch in thickness and well put together. Between there is a lining of felt. The roof consists first of inch boarding upon which is laid felt, and covered finally with corrugated iron. It will be seen that the substantial character of the building has the effect of making the incubator room less subject to outside atmospheric influences than would be the case if the walls and roof were built of lighter material. In Appendix D are given records of outside and inside temperatures. Fig. 54 shows the ground-plan of shed.

In a building of this kind, where the consumption of oxygen in the atmosphere when twelve lamps are burning, and also to supply the 1,200 eggs—which is the capacity of the machines at work—must be very considerable, and, after careful consideration of this question, a system of ventilation was adopted which is, we believe, a novelty. Outside we have eight 3-inch pipes, their terminals 5 feet above the ground, as shown in the illustration. These are carried down outside to within a foot of the floor, and then enter the building, the air passing through regulating gratings, so that the current can be controlled. The object of bringing the air in below the level of the machines is in order that

as it rises such as may be required for the eggs can pass directly into the incubators without being contaminated by the lamps, whilst at the same time the lamps themselves are supplied with perfectly fresh air. In the apex of the gables we have large regulating ventilators, so that the air entering a little above the floor is drawn upwards to the lamps and the machines, and then passes out above. This method of ventilation has proved an unqualified success. Recently a gentleman who has had very large experience in incubator work, on visiting the shed, expressed his surprise at the purity of the atmosphere, and that is one of the best

covered with lead, for cleaning and refilling the lamps, and thus there is no danger of oil being spilled near the incubators. Large double doors open from the outside, first into the small room, and from there into the incubator-room. Inside we have tables for cooling and testing the eggs. These are fitted with flanges, so that as the eggs are tested they can be laid upon the tables without any danger of rolling off. For the work of testing, the shutters fitted to the windows can be closed. Of course, the cost of a house such as described is considerable, but it is impossible to work successfully under antagonistic conditions, and those who go in for

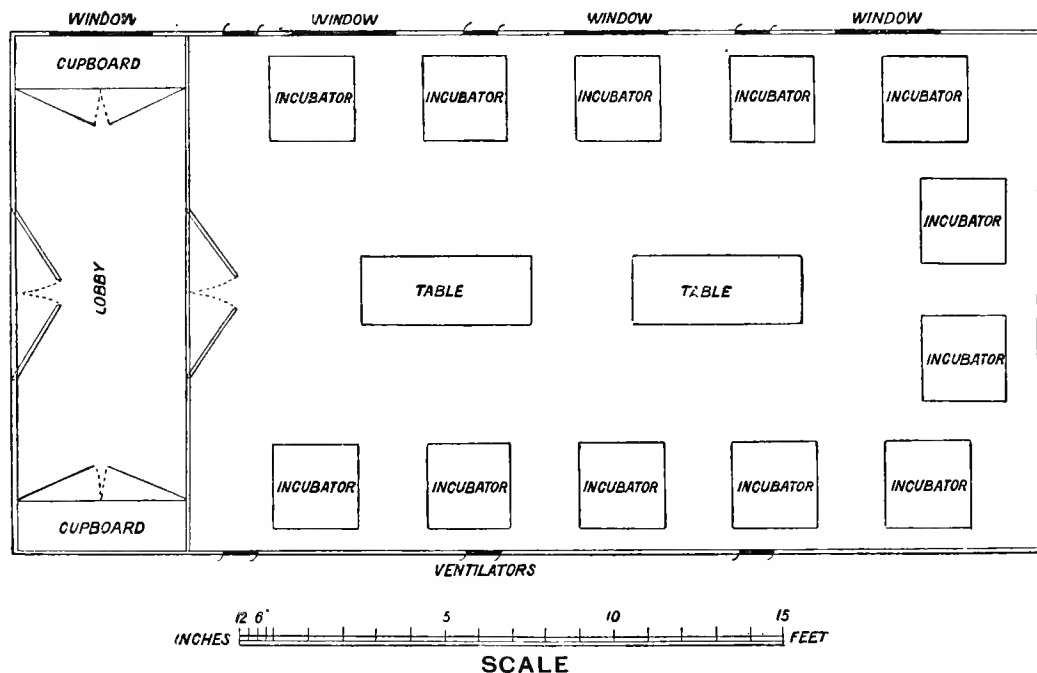


FIG. 54.—INCUBATOR-SHED—GROUND-PLAN.

testimonies which could be desired. During warmer weather more air can be given by opening the windows. It may be explained that these windows—of which there are four—are all on the east side of the house. Under no circumstances should windows in incubator sheds be on the south side, or even on the west, because during the hotter months of the year that would raise the temperature of the room to a very large extent. In order to provide against excessive heat, this incubator-house has been placed under the shade of a very large walnut-tree, keeping it cool in summer.

As already explained, the building is divided into two parts—namely, the larger room for the incubators themselves (Fig. 56), and the outer room, where the stores are kept and the lamps are cleaned. This outer room is fitted with cupboards, the tops of which are

incubation upon a large scale will find that the capital expense is justified.

TYPES OF MACHINES.

One result of the great increase in the use of incubators has been to stimulate their production, and many machines are now offered for sale. So long as the Hearson Patents were in force, that type stood alone, and there was no serious competitor. But with the removal of any restriction we have many others which are confessedly copies of the "Hearson," and are sold as such, in some cases with minor modifications. Since this chapter was last revised a new class of incubator has appeared, on what is known as the hot-air principle, and it will be sufficient if we select for description one representative machine of each class.

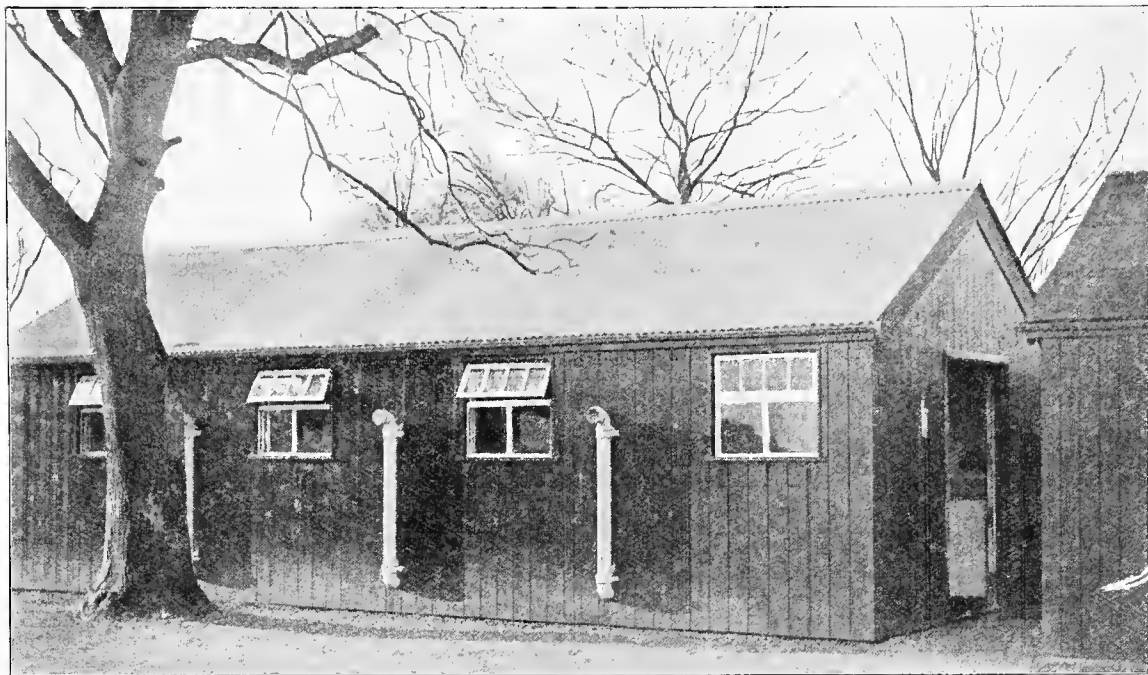


FIG. 55.—INCUBATOR-HOUSE, COLLEGE POULTRY FARM, THEALE.

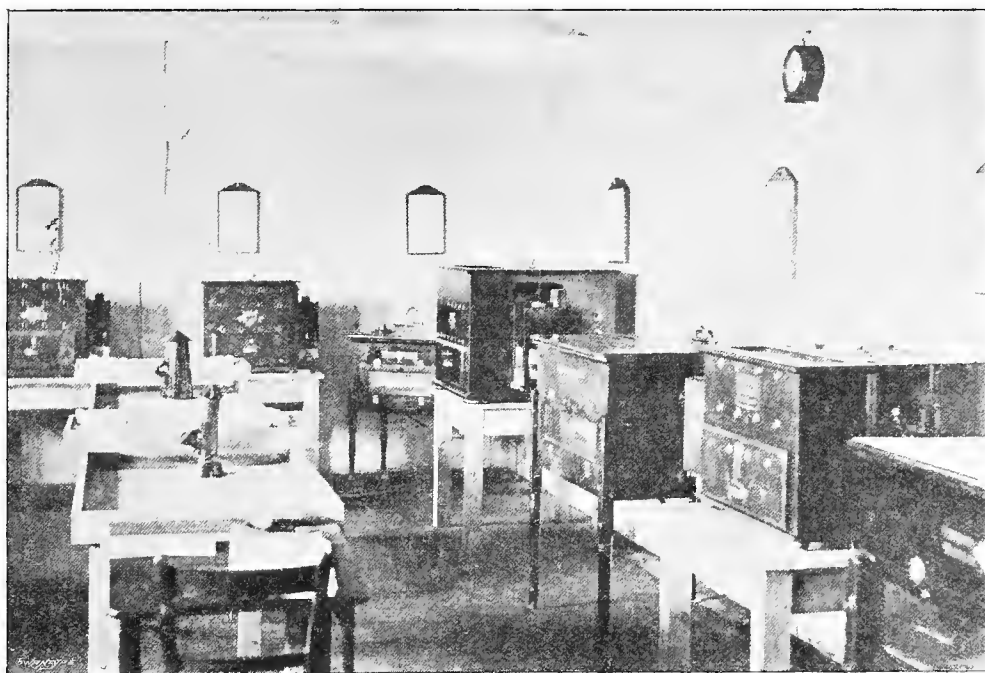


FIG. 56.—INCUBATOR-ROOM, COLLEGE POULTRY FARM THEALE.

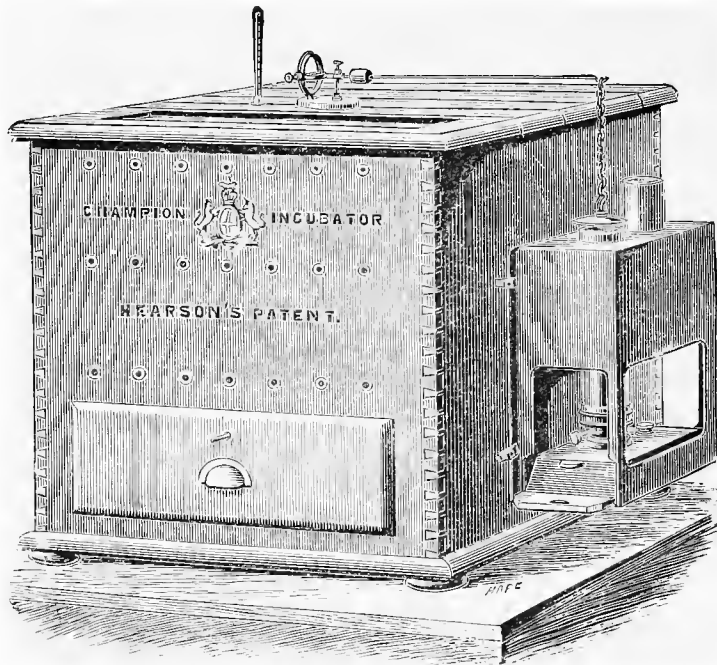


FIG. 57.—HEARSON'S INCUBATOR.

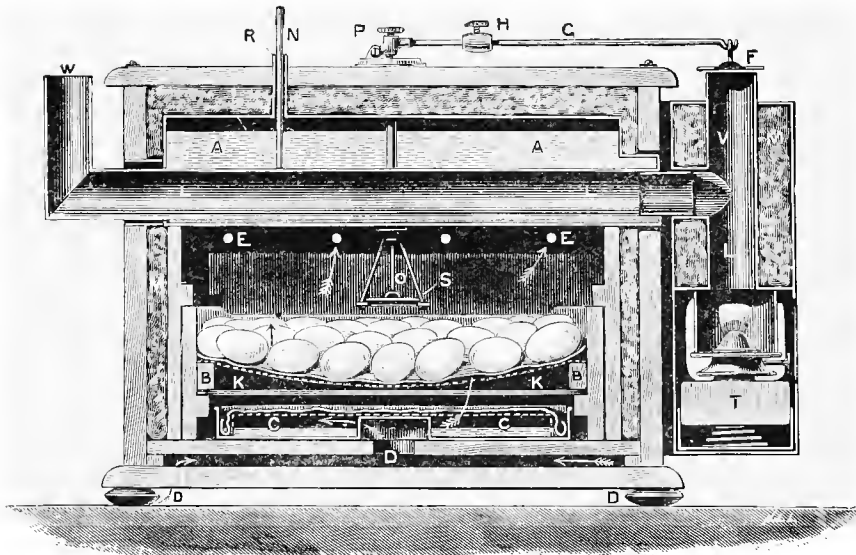


FIG. 58.—SECTION OF HEARSON'S INCUBATOR.

A A.—Tank of water.
B B.—Movable egg tray.
C C.—Water tray.
D D D.—Holes for fresh air.
E E.—Ventilating holes.
F.—Damper.
G.—Lever.

H.—Lead weight.
K K.—Slips of wood.
L L L.—Lamp chimney and flue pipe.
M M M.—Non-conducting material.
N.—Tank thermometer.
O.—Needle for communicating the expansion of the capsule S to the lever G.

P.—Milled head screw.
R.—Filling tube.
S.—Thermostatic capsule.
T.—Petroleum lamp.
V.—Chimney for discharge of surplus heat.
W.—Chimney for discharge of residual products of combustion.

The overflow tube is the upper one, situated at the right-hand side of incubator, and the lower tube is for emptying the tank.

In selecting an incubator, we must look to excellence of manufacture, but primarily to the principle upon which it works. The struggle now is between the tank and hot-air machines, both of which have their advocates. Our predilection has been, and is yet, in a variable climate such as that prevailing in the United Kingdom, for the tank machine under ordinary conditions. But we have found the "Cyphers" to yield equally satisfactory results. This may be explained by the fact that in our incubator-shed the variations of temperature* are minimized greatly, and hence the most favourable conditions are provided. The fact that incubator cellars are largely employed in America may explain why hot-air machines have there met with so great a success, though a better knowledge of essential factors in incubation, and consequent modification in the machines, has helped this result. In selecting the "Hearson" and "Cyphers" incubators as representatives of their respective types, we do so without suggesting that other appliances are not equally efficient.

THE "HEARSON" INCUBATOR.

The English incubator which has attained the greatest amount of success is the "Hearson" (Fig. 57), and its widespread use in all parts of the world stamps it as an almost perfect machine. It is excellently designed and carefully made, with a marvellously delicate regulator, well applied to the purpose in view. The regulator consists of a small metal capsule, formed of two pieces of thin sheet brass, soldered together at the edges. Inside are about twenty drops of a liquid which boils at the temperature required to be maintained in the drawer (104°). So long as this capsule is not subjected to sufficient heat to make the contents expand, the pieces of brass remain close together, but as soon as the warmth is high enough they distend considerably. The power thus generated is used to work a lever, by means of which a cap is raised from the escape chimney, and the hot air from the lamp, instead of entering into a tube running through the water-tank, passes off, and the temperature immediately sinks again. We have known this regulator keep an incubator to within half a degree for weeks, in spite of varying weather, and Mr. Hearson must be complimented upon producing the simplest and best regulator used for this purpose. The eggs are laid in a concave drawer, upon perforated zinc, below which is a water-tray; and as fresh air can only enter from below, and has to pass through a cloth soaked with water, it becomes charged with moisture, by which means this important element is provided for. All that is required is to see that the air is not very cold as it enters the inlet, for then there is danger of too little water being absorbed by it. The "Hearson" incubator is made in several sizes, from a dozen eggs upwards, but we prefer the use of those

under fifty-egg capacity and upwards, as they are found more reliable, and the saving in cost is comparatively small. Further details are given in the section drawing on p. 98 (Fig. 58).

THE "CYPHERS" INCUBATOR.

This machine, as already explained, is of American make, but has been largely sold in Europe. Its external appearance is shown in Fig. 59. Not having a tank considerably reduces the cost of production, but it differs distinctly in other respects from the machines which are almost universal here, apart from the question of hot air. In the first place, the method of ventilation is altogether changed; there is no

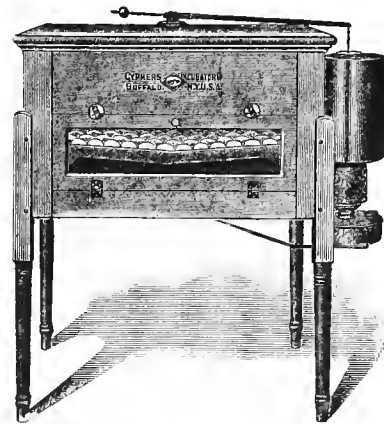


FIG. 59.—"CYPHERS" INCUBATOR.

bottom supply of air, nor are there any holes for either inlet or escape in the egg-chamber of the machine. In appearance we have the same compact body with a lamp at one side. Fresh air is drawn upwards by the side of the lamp, heated, passing into an upper chamber above the egg-drawer without being affected by the fumes of the lamp. The air-chamber has at the bottom a framework upon which is stretched felting, through which the heat has to find its way downwards. It will be realized that in this passage, which must be comparatively slow, there are no streams of hot air, and the heat is distributed by diffusion, which secures regularity and uniformity of temperature. The heat now passes down through the egg-chamber and into a lower chamber, from which it is drawn outwards by the heat of the lamp. It is claimed in this way that there is an even distribution with regular circulation, and that, therefore, an even temperature is maintained. Another striking peculiarity of this machine is that moisture is not supplied, and it is claimed that there is always enough moisture in the atmosphere to supply the needs of the chickens. That is a point upon which very different opinions are held, and it is only by testing and practical experience that

* See Appendix D.

it can be proved; but of course the absence of a moisture-tray does away with the necessity of an influx of cold air, and therefore all the air passing into the machine is warmed. The makers state that as it enters the air increases in moisture, and by the time it reaches the air-chamber its relative humidity is equal to that of the outer air. The regulator consists

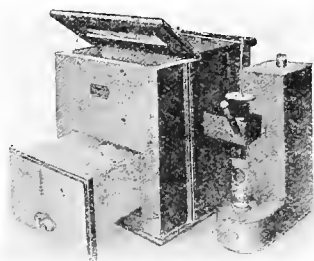


FIG. 60.—TAMLIN'S SELF-FILLING LAMP.

of a double-action thermostat. It is many years since the thermostat was first tried in this country, and given up because it was less delicate than the capsule invented and introduced by Mr. Hearson. The makers of the "Cyphers," however, have now greatly improved the thermostat, and the power is more than sufficient to maintain regularity of temperature. The fumes from the lamp escape by a chimney, over which a cap is placed similar to that met with in various English machines, and is regulated by that cap. There are several other points in this incubator which are interesting. In the first place, there is no drying-box; the trays do not quite fill the egg-chamber, and the chickens coming forward to the light—as there are windows inserted in front—drop down below the egg-tray and remain underneath. This is an interesting change which could scarcely be adopted with safety if the inlet of air were from below, but, as the hot air descends upon the eggs, the air is not contaminated by the chickens. Trays are provided, divided into different compartments, so that the eggs from different breeds may be kept in the same incubator and distinct, for registration and rearing purposes.

Detailed descriptions of other machines are needless, but we have used with considerable success the "Nonpareil" (W. Tamlin), the "Christy" (E. Spencer and Co.), the "Danum Queen" (W. T. Chafer), the "Acme" (P. Walsh), and the "Clive," the latter upon novel principles, not yet fully tested.

SELF-FILLING LAMP.

With the majority of incubators lamps are employed; in fact, there are comparatively few places where gas could be used. Moreover, under ordinary conditions oil is preferable, due to the fact that with it there are none of the variations of pressure which we usually

find in connection with the supply of gas. Lamps, however, require to be carefully attended to, and to be regularly filled. To minimize the labour in connection with lamps, Mr. W. Tamlin, of Richmond, Surrey, has introduced an automatic self-filling lamp, of which Figs. 60 and 61 show the appearance and the section. The object, of course, is to save the time and trouble of filling the lamp each day, and we have worked the arrangement with considerable success. The apparatus consists of a reservoir which is attached to the lamp, supplying it automatically as the oil is consumed, and during the whole period, until the supply is exhausted, the oil in the lamp is kept at the same level. The tank will hold enough oil to serve an ordinary lamp several days, and, as a consequence, what is by no means the pleasantest part of the management of incubators is reduced to a minimum.

MANAGEMENT OF INCUBATORS.

The fact of having an incubator is, however, not in itself the primary question. These machines, however ornamental and well made they may be, are absolutely useless unless they effect the purpose in view, namely, the hatching of chickens. Hence the importance of proper management. For more than fifty years it has been possible to hatch chickens artificially. In the earlier days, undoubtedly, these birds were very inferior in natural vigour to those brought out by ordinary

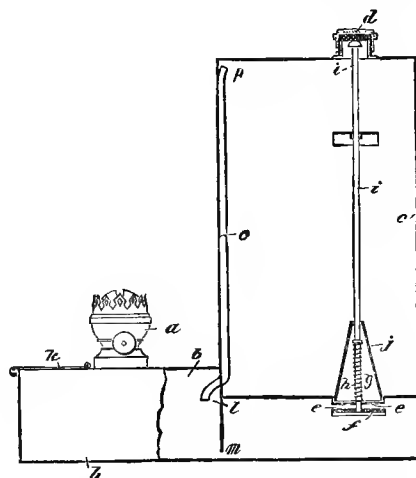


FIG. 61.—SELF-FILLING LAMP—SECTION.

methods, due to many causes with which it is unnecessary at the present time to deal; in fact, it was at one time an axiom that chickens could be hatched artificially, but not reared. The explanation was that they lacked stamina and strength. The consequence was that, even where the percentage produced was a satisfactory one, the number reared was exactly the

reverse. For a long time it was not easy to understand the reason for this state of things. Part, undoubtedly, depended upon the treatment of the chickens after they emerged from the shell, and we believe that much of the mortality in chickens was owing to the foolish system of removing them from the incubators very speedily after they were hatched, as well as to the coddling system during the period of raising. More, however, was due to a failure to realize several points in respect to the machines themselves. Experience has shown that success with any incubator depends to a considerable extent upon evenness of temperature, but even more to the arrangement for the supply, during the entire period of development, of fresh, pure air. A badly-ventilated incubator would undoubtedly result in a large number of chickens dead in shell, varying in the extent of their development, to some degree, upon the vigour of the embryo. In seeking to conserve the heat, the danger with many machines was that the chickens whilst in the shell were not supplied with the amount of oxygen requisite for their development. Until this point was understood there can be no question that incubators were most unreliable and doubtful as to their value. The inventor of the "Hearson" incubator must be given credit for being amongst the first to make provision for a constant supply of fresh air. At the same time, even with a machine so good as the "Hearson," much depended upon the conditions under which it was placed, and it should be understood that any mechanism can only operate successfully within its limitations. If an incubator were placed under conditions where it was impossible that the air surrounding it should be fresh, it is easily understood that the success of hatching would be very doubtful indeed. Having seen these machines in all sorts of holes and corners, one found in this fact the explanation for many failures. Moreover, incubators require to be kept where the temperature is fairly equable; placing them in a building or room which is hot during the day and cold at night would be a strain upon them that it is scarcely possible for any machine to overcome. We must, therefore, realize that an incubator, whilst automatic, must not be tried beyond its capacities.

An important point is the temperature at which incubators should be operated. If we were able to always keep machines in the usual spring temperature, say 60° F., attention to this point would be needless. But we have to provide against variations, and must act in accordance therewith. Our object is to keep the eggs whilst hatching as near 102° as possible, as that is about the heat of a hen. In the majority of incubators it is impossible to keep the registering thermometer among the eggs, as it would either not be seen easily or would be liable to break. Hence, in nearly all makes it is above the eggs. For that reason it does not record the temperature of the eggs,

but of the stratum of air immediately above them. In a machine with bottom ventilation, and in which is constantly going on a conflict between the heat from above and the cool air entering below, the difference is greater than where the air circulates downwards, but in both cases every inch makes an appreciable difference. For these reasons, the temperature at which a tank incubator is worked, as represented by the thermometer, should be varied in accordance with the following table (hot-air machines one degree less) :

	<i>Degs. F.</i>	<i>Degs. F.</i>	<i>Degs. F.</i>	<i>Degs. F.</i>	<i>Degs. F.</i>
Room	40	50	60	70	80
Egg-chamber	106	105	104	103	102

It will be found that running incubators on this basis will maintain eggs all through at practically the same temperature.

MOISTURE.

The question of moisture has led to a large amount of discussion. In English tank machines water-trays are employed, the object of which is to ensure sufficient moisture in the atmosphere, whereas in the American hot-air incubators no additional moisture is supplied. We are making careful observations as to both systems, but as yet have had no opportunity during a very dry season, without which experience satisfactory conclusions cannot be made. For some time we have kept a careful record of humidity in the atmosphere in our incubator-house, and the following are the results for six months (see Appendix D) :

February, from	70 per cent.	to	81 per cent.
March	" 69	"	94 "
April	" 56	"	73 "
May	" 59	"	74 "
June	" 56	"	68 "
July	" 64	"	72 "

It may be explained, however, that the period was very damp, and that the registering thermometer was suspended in the middle of the room.

GENERAL HINTS.

The following general hints should be observed by all incubator workers, in addition to directions sent out by makers of each machine :

1. Place the machine where there will be a constant supply of fresh air, but carefully avoid draughts.
2. If possible, keep the temperature of the room at from 55° to 65° F.
3. See that the water-trays are regularly supplied with water, which should be first warmed.
4. Always warm eggs before putting into the machine by washing in water heated to 80°. This is specially important when there are eggs already in the drawer. The eggs should be well dried before putting in.
5. Mark the eggs with the date when put in, and that when due. Also, if there is no turning apparatus,

put signs on two sides to know how far they should be turned. They should be turned twice a day, but must be once.

6. Cool the eggs twice a day for ten minutes in winter, and for fifteen minutes in summer; but if the room is warm no harm is done by longer cooling. In tank machines the lamp should be turned down or removed whilst the eggs are cooling.

7. Observe the temperature of egg-drawer whenever the incubator is attended to, as a guide to its correct working.

8. Do not open the egg-drawer too often when hatching is proceeding, but when chicks are out remove the empty shells and place the birds in drying-box, where one is provided.

9. Always keep the lamp clean, properly supplied with oil, and do not burn it higher than is necessary.

10. See that there are no vibrations or jarring shocks in the incubator-room, as these cause deformity in the chickens.

ARTIFICIAL REARING.

Artificial mothers or brooders have for many years proved a practical success, even when they were not nearly so perfect in form as is now the case. Nearly thirty years ago we employed a Cheshire mother with satisfactory results, in spite of many deficiencies which that appliance had, necessitating very great care and watchfulness. The advantages of being able to rear a large number of chickens and of dispensing with the hens are obvious, simplifying the labours of the attendant and avoiding many troubles resultant from keeping a number of hens and chickens together. It is convenient to have the chickens within a short distance of each other, and hence the value of an arrangement which minimizes its dangers. Further, there is no risk in a well-made brooder of a batch of chickens being trampled upon or of their sudden desertion, and, like incubators, they are ready for work at all seasons of the year. It must always be recognised in connection with such appliances that they have no instinct, and hence require constant and careful attention.

It must be conceded, in the adoption of artificial rearing, that the first few days are the most important—that is, when chickens under natural conditions would be in process of training by their mothers. At that time they have a very small amount of self-reliance, and are unable to adapt themselves to their circumstances. It is for this reason that breeders often adopt the plan of putting an older chick amongst the very young ones, in order that its example may be observed and followed by the babies. When once past the initial stage, our experience is that brooder chickens are more self-reliant than those brought up under hens. They have, in fact, been thrown upon their own resources, and their powers are developed at an earlier

stage than would otherwise be the case. The points specially to keep in view are that the chicks must be kept together until self-reliance has been developed, and enclosed so that they can easily find their way back into the warm chamber. Moreover, the heat must be well maintained at this stage of their growth.

BROODER-HOUSES.

In order to provide for the rearing of chickens upon an extensive scale, brooder-houses are now coming largely into use, and some of these are very large, as many as 2,000 birds being accommodated at one time. Fears were expressed formerly as to whether it would be possible to keep in a healthy state so large a number in one building, but that has been proved not only possible, but is carried out extensively both in this country and America. We may fairly give credit to breeders across the Atlantic for their enterprise in this direction. It is not too much to say that twenty years ago the system which is now adopted would have been impossible, due to want of knowledge as to the basal principles of rearing chickens, and we believe that the adoption of the dry system of feeding, explained in the last chapter, has revolutionized our ideas in the direction of intensive poultry-keeping, so far as it is applied to artificial rearing. What is wanted in brooder-houses is that they shall protect the inmates during unfavourable seasons, and therefore they are specially serviceable in the colder months of the year. In fact, brooder-houses are frequently too hot for summer work, in that they do not afford protection against sunshine, and at that season of the year it is much the better plan to distribute the birds where they can find shelter against excessive heat. In order to conserve all the natural heat possible, the front of brooder-houses should have plenty of windows, and in some cases the glass is continued almost to the ground. There must be plenty of room inside the house, and, apart altogether from space enabling the attendant to walk upright, a lofty brooder-house will be much more perfectly ventilated than would a low building. We show two views of brooder-houses. One erected at Pulsack, near Hayle, Cornwall, by Mr. W. Hoskin, is one of the best in this country; it is built upon American lines. In Fig. 62 is shown a fine house erected by Mr. H. Ashton, of the High House Poultry Farm, near the Lickey, in Worcestershire. This house is large, and it will be seen that for exit are trapdoors, runs having been erected since the photographs were taken, so that each lot of birds can be kept separate. Fig. 63 shows the winter brooder-house in use on the College Poultry Farm, Theale, and, whilst on a smaller scale than that previously illustrated, it may be accepted as of a suitable form, in that it may be built to any length. This house was constructed to the author's designs by the Portable

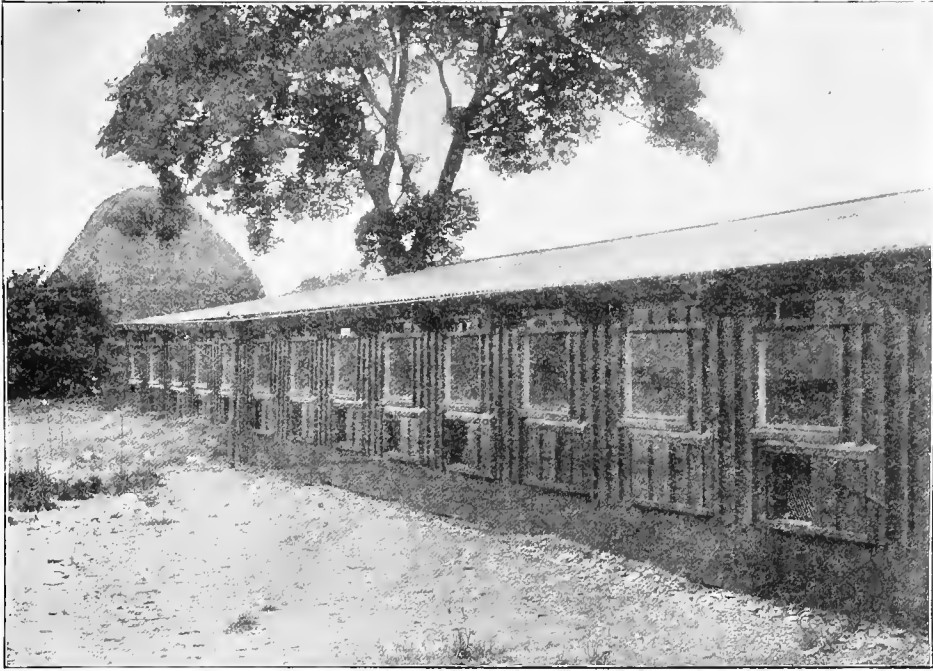


FIG. 62.—ASHTON BROODER HOUSE.

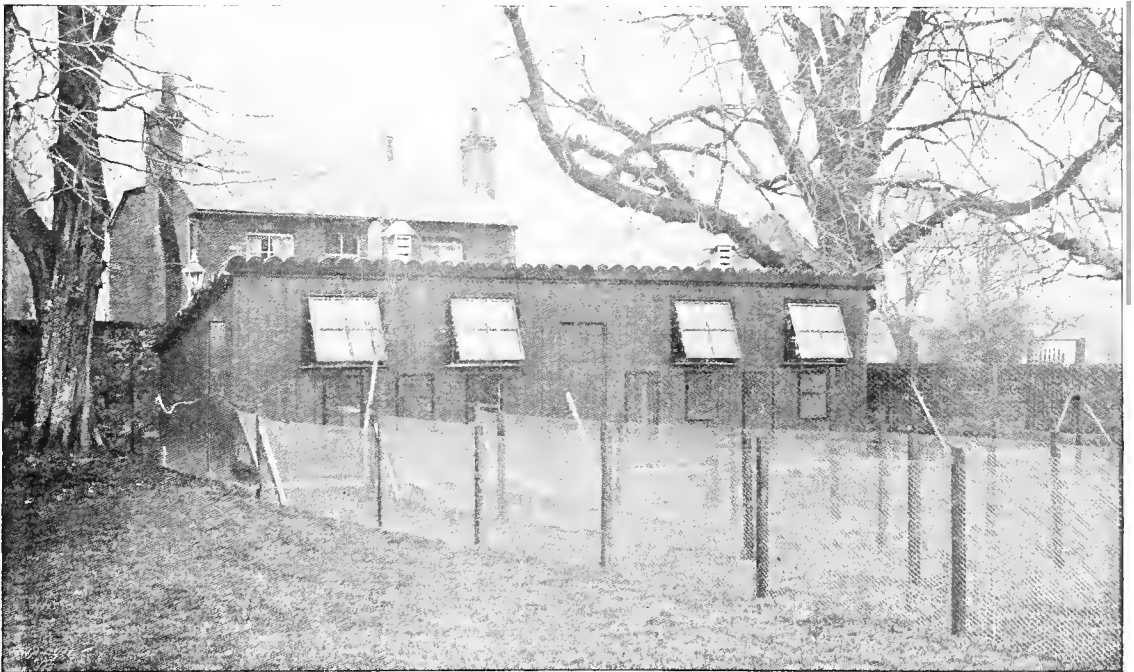


FIG. 63.—WINTER BROODER-HOUSE, COLLEGE POULTRY FARM, THEALE.

Building and Construction Co., of Fleetwood. It is 30 feet in length by 10 feet in width, and is well lighted in front and thoroughly ventilated. The inside is divided into five compartments for the accommodation of the chickens at different stages, access being given to the runs by means of small trap-doors. In the first four of these compartments portable brooders are employed, and hitherto we have used the "Calway Rearer," shown in Fig. 70. The house has a door at either end and one in front, and a footway 30 inches wide runs at the back. The remaining 7 feet 6 inches of the floor is boarded, and upon this is kept a thick bed of cut chaff, in which the food is

life. Fig. 65 shows a form of house for one brooder as used upon the Homeville Experiment Station, Canada. When the chicks have grown sufficiently the brooder is removed.

In America—and the custom is receiving attention in this country—many of these houses are fitted with what are called sectional brooders. These are heated by means of pipes, the temperature of which is maintained by lamps. Fig. 66 is an illustration of one of these four-section brooders, made by the Cyphers Co. Each section is 3 feet long, 18 inches wide, and 11 inches high. They are fitted with six heating pipes, and naturally cost less than separate brooders, there

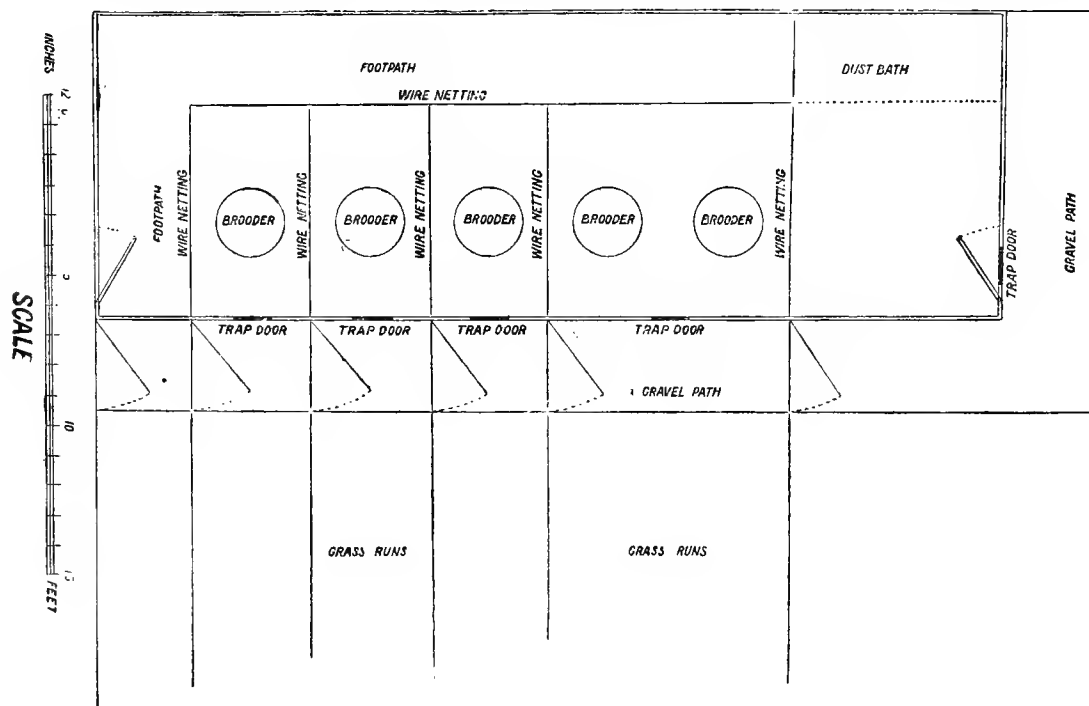


FIG. 64.—WINTER BROODER-HOUSE, COLLEGE POULTRY FARM, THEALE—GROUND-PLAN.

scattered for the purpose of inducing the chickens to take plenty of exercise. Outside the front of the house is a narrow pathway of gravel, and grass beyond. The runs outside are graded in size; as the birds become older more run-space is given to them. Fig. 64 shows the ground-plan of this house. The advantage of all these forms of brooder-houses is that in the early morning and during unfavourable weather the birds can be kept under cover, and it is found—in our climate, at any rate—that this does not in any way interfere with their health or growth. It need hardly be said that all such houses must be kept absolutely clean, and every effort should be put forward to secure efficient ventilation and to prevent the development of parasitic

also being a considerable saving in the labour of attending to them. As they are made distinct from the house, they can be used in almost any suitable building, but must be fitted with divisions to keep the birds separate. Of course they can be increased to any length.

TYPES OF BROODERS.

The number of brooders offered for sale at the present time is very considerable, and it would be impossible to attempt a description of all. Nor is this necessary, because we can practically divide brooders into three types, and it will be enough for our purpose if these are dealt with. The first type is similar to that shown in Fig. 67, although, of course, there are

differences in detail. Others of this make are the "Nonpareil," the "Christy," the "Danum Queen," etc. These brooders practically combine house and brooder in one, and in the majority of cases are fitted with wheels, so that they can easily be moved from place to place. In the first instance they consist only of two, or at most three, compartments: first, the sleeping compartment, heated either directly from a lamp within that compartment, or, as in the "Hearson,"

(8) the grass run. The "Hearson," which may be taken as typical of its class, is a very well-made machine, splendidly ventilated, and, the lamp being in the run, no fumes can enter the sleeping compartment.

The second type of brooder is that shown in Fig. 68, the outdoor "Cyphers." This differs essentially from English brooders, and was designed to meet scratching requirements on the part of chickens. It has two separate compartments. That at the back, in

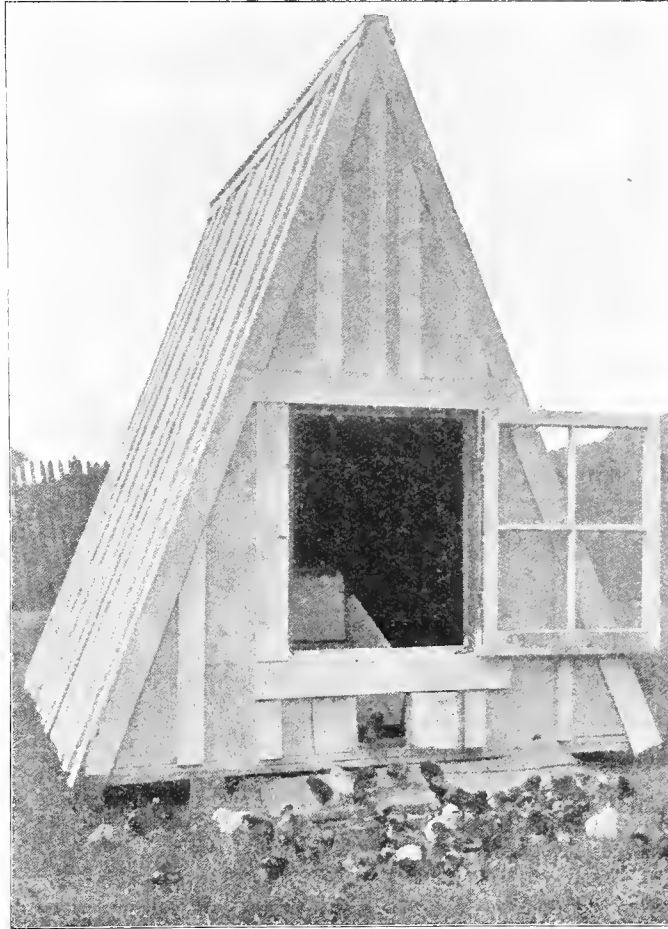


FIG. 65.—CANADIAN DROODER-HOUSE.

with a small tank, the lamp being either in the run or outside the brooder; the second part of the appliance is practically a covered run without floor, but since the adoption of the dry system of feeding we have fitted floors in these runs, using an extension outside when desiring to allow the chickens on to grass. In one or two of the other makes of brooders the appliances are divided into three compartments: (1) For sleeping; (2) a covered run with a wooden floor;

the illustration, contains the brooder proper; in this is what is generally called a "hover"—that is, a circular board, with flannel fastened upon the edges, to radiate the heat upon the chicks. The birds are not restricted in any way, and can pass in and out as they think fit, sometimes in warm weather preferring to remain outside this hover. The heat is obtained from a lamp which is placed below, and, apart from the fact that the lamp is a little out of the way, the arrange-

ment is an excellent one. Special stoves are employed, and have water-jackets to prevent danger of explosion. In front of the sleeping compartment are strips of

periods of the year when the number of birds hatched is few.

GENERAL HINTS.

The points to be observed in the rearing of chickens artificially are as follows :

1. Although a large number of birds may be placed in a brooder-house, it is inadvisable to keep too many together in a small brooder, and whilst during the earlier stages of growth fifty and even one hundred may be accommodated in one brooder, as they grow they should be divided into different flocks. The great point is that they must have plenty of room, and if at all crowded there is always danger of overheating and loss by perspiration. Many of the machines which are said to be capable of holding fifty birds should not have more than thirty placed in them.

2. Many brooders fail because the lamp is situate in the sleeping compartment. It is almost impossible under these circumstances to avoid the air being tainted by fumes arising therefrom, and, moreover, the heat is not nearly so well distributed. We recommend the brooders in which the lamp is outside the sleeping compartment, and in which tanks are used.

Frequently a mistake is made in overheating brooders. The American machines are provided with thermometers, which is a very desirable addition. It must be remembered that the heat rises considerably after the

birds have been in for some time. During the first few days they should be kept at a temperature of about 90° F., gradually reducing until at the end of

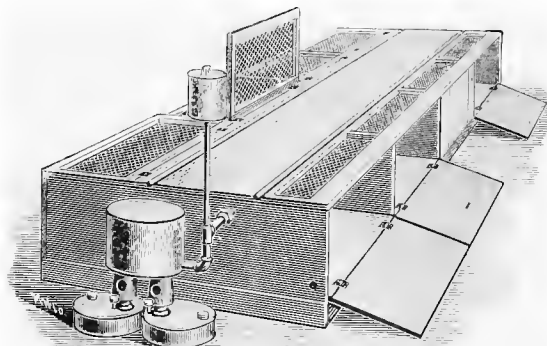


FIG. 66.—CYPHERS FOUR SECTION SECTIONAL BROODER.

flannel, and a slope leads down to the run. Thus the chicks can walk up and down easily, and there is not much fear of their being unable to return to the brooder proper.

They can be kept for the first week or two in this compartment entirely, and fed there, although we find by experience that they prefer to be outside as much as they possibly can. This form

of brooder has commanded a large amount of support, and by practical experience we have tested its value. When there is a considerable number of birds being reared in one field, it is an excellent plan to have movable shelter runs, as shown in Fig. 69, which, fitted on to the front of the brooders, would give access for the chickens to the grass, and yet minimize the danger of their wandering away and becoming lost. These may be made either with solid or netted tops, in accordance with the wishes of the poultry-keeper; in fact, an excellent arrangement is to have one half of the top boarded and the other half netted.

The third form of rearer is shown in Figs. 70 and 71, and is made by Mr. W. Calway. It is round, and has the recommendation of being very simple and cheap. We have used this rearer for many years, and are able to speak highly of it; but it is only suitable for indoor work, and if used outside a cover would be necessary. The circular shape presents several advantages, as the heat is more evenly distributed. The machine has no run attached to it, but recently Mr. Calway has fitted a run, so that difficulty is now obviated. The Calway rearer is most suitable for small poultry-keepers, or at

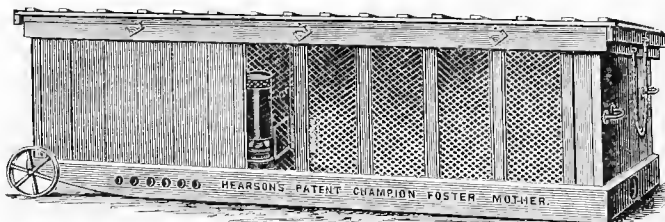


FIG. 67.—HEARSON'S FOSTER-MOTHER.

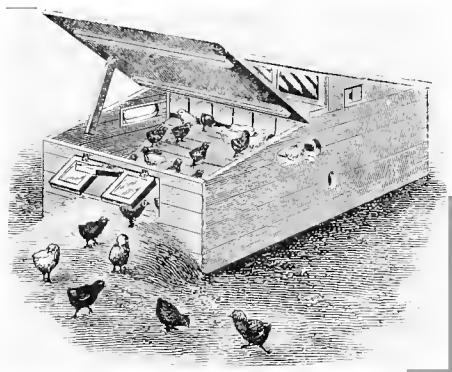


FIG. 68.—OUTDOOR CYPHERS BROODER.

a month or five weeks they do not need to be more than 65° to 70°.

3. Many of the cheaper machines especially fail

absolutely in provision of ventilation. We have opened brooders and were met with a volume of vitiated air. This is fatal to success; no brooder should be employed unless it is thoroughly and efficiently ventilated. Pure air is essential to the raising of chickens.

4. With movable brooders the same remarks will apply as were made with respect to coops—namely,

during cold, damp weather, is that sometimes the young chickens do not appear to know the way back to their brooders, and they hover about, getting thoroughly damp. Of course, with hens this is never met with. In this connection we have not to think of things as we should like them, but as they are. In these days broody hens are scarce enough during the regular hatching months, but they are infinitely more

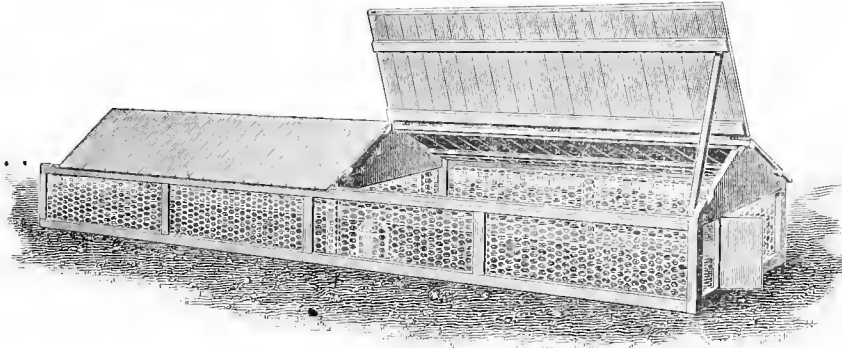


FIG. 69.—CHICK SHELTER FOR USE WITH OUTDOOR BROODER.

give them all the sunshine possible during the colder months of the year, and as little as can be arranged during the summer. Brooders must be kept absolutely clean, and frequently removed on to fresh ground.

DIFFICULTIES IN REARING.

We are face to face with a question as to whether chickens can be reared better by natural means or by

so during the colder months of the year, and for this reason we are practically compelled to depend chiefly upon brooders for rearing at other seasons than during the spring and summer. If it were not that brooders have been brought to a large measure of perfection, the amount of winter hatching and rearing would be very small indeed; in fact, in some of the districts where chickens and ducklings are produced largely,

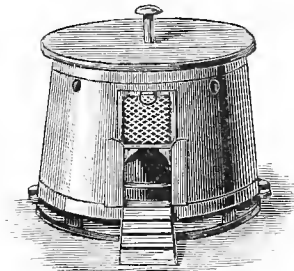


FIG. 70.—CALWAY REARER—OUTSIDE.

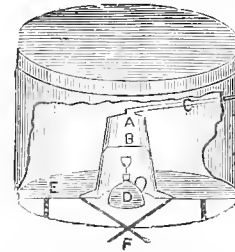


FIG. 71.—CALWAY REARER.

A, Heating cone; B, disc to throw heat to side of cone; C, air-pipe; D, lamp; E, platform; F, regulator.

artificial methods during what may be termed the less favourable months of the year. Personally, we have no hesitation in saying that, all other things being equal, the best results will be obtained by means of hens, for their instinct teaches them how they can avoid certain troubles, and, moreover, the protection they give to the chickens in itself means a very great deal. Those who have had any experience with artificial rearing know that one of the troubles, especially

and artificial methods have not been adopted to any great extent, during the last few years there has been a considerable shortage, to the loss of the breeders. Thus we are face to face with the fact that we must adopt artificial methods.

As already mentioned, one of the chief troubles which most chicken rearers find during the colder—and especially in damp—periods of the year is a looseness of the bowels, and a form of scouring, with con

siderable body-heat. This may, to some extent, be due to bad feeding and also to overcrowding, but we have come to the conclusion that in the majority of cases it is owing to chills. The birds are exposed either to a biting wind or to cold rain, stopping out in the open, and such delicate creatures as these are very easily affected. It is difficult to suggest a remedy for such a state of things, as the disease runs its course very quickly indeed. Whilst it is true that many people make a mistake in keeping their chickens too hot, especially after the first week or two, at the same time it would appear evident that there is a danger in having the brooders too cold. What we really want is that they shall be warm enough to keep the birds thoroughly happy and comfortable, and our own idea is that during the first week this will be at about 90°, and not higher, as some people suggest. Of course, during severe weather a brooder takes a great deal more heating, as there is a rapid elimination of the heat. In order to conserve this heat, we are afraid in some cases ventilation is very deficient, and under such conditions, then, assuredly the bowel trouble will become very evident. It must be borne in mind that a brooder may be perfect for twenty-five to thirty chickens, thoroughly well ventilated, giving them plenty of room, and working at the proper heat; but if twice that number of birds is placed therein, the heat will be too great, the ventilation will be insufficient, and there will be reduced vitality all round. Most of the machines which are placed upon the market are named as accommodating many more than ought certainly to be placed therein, and we generally recommend that a machine which is advertised as large enough for fifty chickens ought never to accommodate more than thirty.

This, however, leads us to a point which is of very great importance—namely, where the brooders should be placed, and in order to come to a right decision we must have a clear idea as to the time of year when we are using the brooders. During mild weather they may be put in the open with the greatest safety, and, even during moderately cold weather, especially if we have a considerable amount of sunshine in the daytime, there is no reason why they should not be on the grass, but we must take care that under conditions of this kind the heat is maintained at night. During the day the birds can run about and keep themselves warm. Moreover, if there is sunshine it warms the air; but at night the conditions are entirely opposite, and unless great care is taken we shall find that the birds will be chilled.

A mistake which is frequently made by chicken rearers is, especially during the damp periods of the year, in placing the coops or brooders under trees. Such an arrangement is certainly one of the very best during dry weather, for the shade thus obtained helps materially in the growth of the chickens; but during

damp weather, and especially at those seasons of the year when there is not a great amount of sunshine, the arrangement does not contribute to success, and instead of the birds growing well they are uncomfortable throughout the greater part of the day, and are living in what is practically a damp atmosphere. It has been mentioned before that we should endeavour as far as possible to minimize extremes, and whilst too much sunshine may be harmful at the season when the days are long, we can afford to use every ray of sunshine during the other periods of the year. A place, therefore, that would be most valuable for rearing in summer may be absolutely unsuitable in winter, not only by reason of the lay of the land, but also the amount of trees around. During hot weather, and especially in those districts which have not much in the way of natural shelter, a great deal can be done to give this shelter. Hurdles, in which furze-bushes, branches of trees, or even straw have been entwined, may be placed so that they will always give a direct shade. We have seen a very excellent arrangement—namely, a piece of thatch built on to a light framework, about 10 feet square, and raised above the ground about 30 inches. Such a place as this is invaluable under the conditions named. We have only to apply to our fowls what we feel ourselves—namely, on a hot day we want shade, and on a cool day we like sunshine.

HARDENING THE CHICKENS.

The tendency in connection with the domestication of all classes of animals must ever be towards weakening the constitution. Animals and birds living in a wild state are subject to various influences which eliminate the least fit; but under domestication there is always a danger of breeding from animals which, however good in other respects, have a weakness of constitution that, combined probably with similar influences in the opposite sex, tend to the steady deterioration of the race. These influences, however, are undoubtedly increased by the conditions under which great numbers of birds are maintained, and also the methods adopted by many poultry-breeders. There are multitudes of breeders, especially those who live in the neighbourhood of our great centres of population, and whose areas are limited, who cannot help running this risk; but even with them a great deal might be done to avoid the danger to which reference is here made. Theoretically, and in many cases practically, we must provide shelter for our birds; but there comes a stage when it is desirable to harden the growing fowls that are intended either as breeding or laying stock, with a view to giving them that vigour of constitution that will be required to stand the strain.

During the stage of chickenhood we are sure that it is absolutely necessary that we shall give shelter and

protection to our birds; but there comes a period when they have passed from babyhood into the youthful stage, and then are emerging towards adulthood. It is here where steps should be taken to harden the fowls, and the first point to accomplish is to give them as much liberty as possible. Freedom of range is a most important element in the development of the physical powers, and birds which have to bear exposure and to seek for natural food over a wide area are much more likely to give satisfaction to the owner than those which are coddled in small runs near at home. The principle here laid down will be generally accepted, but there is another point which must be borne in mind. It is possible that we may give the birds all the advantages of free range, and by a judicious system of feeding compel them to seek for a large amount of natural food, and yet at the same time sacrifice all these advantages by a bad system of housing. During the day the birds are in the open air laying up a store of energy, and at night we crowd them into small houses—probably badly ventilated—which more than compensates in the harm done for the benefit received during the day. It is necessary in a great number of cases for protection to house the birds; but if there is a plentiful supply of trees, we are sure that it is a good plan to let them roost out in the open, unless, of course, there is any danger of foxes or other marauders.

Where houses must be used for growing chickens, these should be roomy, and especially during the late summer and autumn they should provide little more

than shelter and protection. Houses built with one side open or simply netted are much more useful for this work than those which are boarded completely all round. Houses intended to accommodate the growing stock should have at least the front, and, if possible, one end, absolutely open, except for the netting, which is simply a question of preventing foxes and other vermin from finding access to the birds when at roost. A house of this kind can be easily designed. Movable sides can be fitted, which may be entirely removed during the finer months of the year, or by having shutters hinged at the top inside and folding up against the roof the house will be available at other periods when more shelter is required. Few of those who are handy with tools would find it difficult to build a house which can be removed in a few minutes if it were found not strong enough to bear wheels. In the latter case much stronger joists and framework would be required than if the house were built upon the usual pattern—that is, completely boarded. It will be seen that where the growing stock sleep in houses of this kind they will naturally grow much hardier than if they are put together in the ordinary form of poultry-house. We need fear very little in the way of loss under these circumstances, and there can be no question that, although in some cases the birds may be a little slower in development, owing to the absence of the forcing system, when they are intended either as breeding or laying stock they will be much more vigorous, hardier, and firmer in flesh than if treated in the ordinary manner.

CHAPTER XIV.

THE FEEDING OF POULTRY.

WHAT IS FOOD?—WHAT FOOD DOES—VARIETY OF FOOD NEEDED—ELEMENTS OF FOOD—NATURAL FOOD—GRIT—PLANT AND ANIMAL NUTRITION—ARTIFICIAL FOOD—ANALYSIS OF FOODS—SOFT AND HARD FOOD—FOOD TABLES—HOW TO FEED—WATER—FEEDING CHICKENS—TIMES OF FEEDING—SUBSTITUTES FOR WORMS—GREEN FOOD—OBJECT IN FEEDING.



THE question of feeding is of very great importance, dealing as it does with the process of preparing food for human consumption. In connection with the question of feeding, the first question to be asked is, What is food, and what does it do? We cannot do better than here quote from Professor Atwater, who thus concisely says: "The body is a machine. Like other machines, it requires material to build up several parts, to repair them as they are worn out, and to serve as fuel. In some ways it uses this material like a machine—in others it does not. The steam-engine gets its power from fuel; the body does the same. In the one case wood or coal, in the other food, is consumed. But the body not only uses food, but its own substance also, for its fuel. When the fuel is burned in the furnace, only part of its latent energy is transformed into the mechanical power, which the engine uses for its work; the larger part is changed to heat, which the engine does not utilize. A large part of the potential energy of the food, and of its own substance, which the body consumes, is likewise transformed into heat, but this heat the body uses, and must have to keep it warm. And, finally, metal from which an ordinary machine is built and repaired is very different from its fuel, but the same food which serves the body for fuel also builds it up and repairs its wastes."

WHAT FOOD DOES.

From this we learn that the body is the machine, and food the fuel which provides its motive power. But food is more than this, for it repairs the waste of tissue, and restores that which is lost by elimination of heat. What this waste is depends greatly upon the conditions under which an animal exists, and the work it has to perform. In a cold exposed climate there is a great loss of vital force through elimination of heat by the atmosphere. In a very warm climate elimination is due to perspiration, or loss of moisture through

the pores of the skin. A heavy worker expends muscle and force by exercise of physical powers, whereas an animal fed simply to form food for man, of whatsoever kind it may be, has no such demand upon it, and hence it is only the external conditions which reduce the material of its body.

We have learnt, therefore, that food is used to repair waste of the body. The transformation of food into all those elements of which the body is formed is one of the great mysteries of Nature. Give it in whatever form we will, it is taken into the stomach, and there divided up into various elements, some to repair the waste referred to, others to enlarge the body, yet more to expend itself in some cases in formation of eggs and of young. It is not necessary that we should here refer in detail to this process of food formation, as it is enough for our present purpose to know that it is regular and complete.

VARIETY OF FOOD NEEDED.

To rightly understand this subject it is necessary to remember the conditions under which fowls are kept, and that the demands upon the system vary so much, that one food will not do equally well under all circumstances. There is no perfect food for poultry—perfect, that is, in its suitability to all kinds of fowls wherever they may be. Such a food is an impossibility, but the great variety of food which can be found everywhere is a tribute to the variability of our needs. Nature does not work uselessly, and for all things there is some work to do. Animals themselves teach us by their actions that it is instinct to eat whatever the system needs. What is the right food to be given depends upon the conditions under which birds are kept, and the purpose for which they are destined. Food should vary according to the season of the year. A little Indian corn may do good in winter, but it is bad in warmer weather; and such foods as rice may be useful in summer, but would be useless in winter, in that

they do not contain sufficient heat elements. Thus, when we desire eggs, the food should not be flesh or fat forming more than sufficient to repair the daily waste of tissue and heat, but contain elements requisite for making albumen, fat, and phosphates, which form the principal materials in an egg. It will easily be seen that when the weather is cold, the material available for making eggs is considerably reduced by elimination of heat from the body, and therefore if they are to be produced this loss must be made up. On the other hand, if flesh is to be formed, to give egg-making constituents would be waste of food, and fats are chiefly useful in this direction. Again, chickens require different food from adults, because of the necessity to build up the frame and form feathers. And in this connection it is necessary to say that, as far as possible, the food supplied should be well balanced, or there may be a great waste, and for the same reason there should not be too much or too little.

ELEMENTS OF FOOD.

Food has several distinct elements, each of which has a specific influence :

1. Albuminoids, or nitrogenous compounds: form bone, horn, feathers, skin, blood, muscle, eggs. Ratios: growing birds, 15 per cent.; adult stock, 12 per cent.

2. Soluble carbo-hydrates: support respiration and animal heat. Ratios: summer, 55 per cent.; winter, 65 per cent.

3. Fat: gives oily secretions and softens flesh. Ratios: breeding or laying stock, 2 per cent.; fattening, 5 per cent.

4. Woody fibre: of small value.

5. Ash: of small value, except lime.

Dr. Warington shows that "birds have apparently no power of digesting vegetable fibre; the food passes too quickly through the system for the fibre to be attacked." Hence, bran and the harder vegetable matters are not very suitable as poultry food. He also states that "common salt is well known to be a useful addition to the food of animals. It is stated to quicken the conversion of starch into sugar by the saliva and pancreatic juice. When sodium salts are deficient in the food, salt supplies the blood with a necessary constituent. . . . They are absent in potatoes, and generally absent in grain of all kinds."*

NATURAL FOOD.

In calculating what food must be given, it is necessary to consider, first, that which is obtained naturally. Where fowls are absolutely in confinement everything must be supplied, but when at liberty they obtain an enormous quantity of natural food, by which is meant worms, slugs, seeds, and lime, and the amount

of this must largely determine both the quantity and nature of that artificially supplied.

First let us look at the question of worms, which is of primary importance. At one time it was thought that the best soil on which to keep poultry was sand or gravel, but this is an undoubted mistake. Gravel has certain elements which are very valuable indeed, but pure gravel is almost as deficient as sand in worms and other forms of lower life, which are essential to success in poultry-keeping. Perhaps the perfect soil is substrata of clay, with a top layer of gravel and loam mixed. Failing that, heavy clay is better than sand or gravel. This may appear heterodox, but it is truth, nevertheless. Worms and slugs are essential to poultry-keeping, they being natural food for fowls. What is the opinion of poultry themselves on this matter can be seen by the way in which they seek after and struggle for worms; and one advantage of letting the birds out very early is that then can be obtained a plentiful supply. On French vineyards they follow the ploughs during the periodic upturning of soil on the vines, and every farmer ought to give the same privilege to his poultry. The advantage will be all his own, as they will obtain a large quantity of valuable food, to be obtained in no other way, and they will clean and manure the ground. It is satisfactory to note that this is being more appreciated by farmers. A gentleman in Gloucestershire states that he had arranged with a farmer to pay £2 per acre rent for permitting his fowls to run over a pasture-field in occupation of the farmer. So great was the improvement in the grass, that the latter afterwards acknowledged that it would have been quite worth his while to have paid for the fowls to run on the field, instead of receiving money for permitting them to do so. And in some districts may now be seen fowls following the plough, a custom which should be widely extended. They will render the same service as wild birds, and give greater return to the farmer.

Fowls at liberty also obtain a large amount of grub, insects, and seeds, all of which are valuable as food.

GRIT.

It is important to understand the process of food-digestion in fowls, as of all birds, in order to appreciate the value of grit, by which is meant small stones, which are swallowed for a very definite purpose, and are eagerly sought for.* We have tried the experiment of depriving fowls of grit for several days, and keeping them without food for twenty-four hours, and have found that they would select the grit first and the food afterwards. Birds can frequently be seen to assiduously pick up something from a road-bed over which they may be running. There is no food there, but their instinct teaches them the necessity for grit in order to secure proper assimilation of the food. And

* "Chemistry of the Farm." London: Vinton and Co. Limited.

* For process of food digestion, see p. 113.

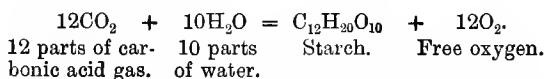
if we cut open the gizzard of a fowl, it is to find a number of small stones therein. Hard material of this kind can have no attraction in itself, as in the case of food; it cannot possibly satisfy the appetite, and it is not unreasonable to assume that the grit is present for a definite object. At the same time, we believe that a dual purpose is served by the grit. During the grinding process the edges will be worn off, and the secretions to which they are subjected will dissolve the particles so produced if soluble, so that they can be utilized for supporting the frame, and, in the case of hens, supplying material for shell formation. It is surprising how much grit even young chickens will consume, and if not obtainable naturally, it must be supplied. Flint grit is the best, but road-sweepings, broken crockery or glass, oyster and other shells, are all valuable.

We have dealt with this question at some length because there are those who deny the necessity for grit, and it is desirable to make the matter plain, for it is not possible to keep birds in health without this material. One authority says that such is the power of the gizzard in almost all kinds of poultry that hollow globes of glass are reduced in it to fine powder in a few hours. The most rough and jagged bodies do no injury to the coat of the gizzard. Spallanzani even introduced a ball of lead with twelve strong needles so fixed in it that their points projected $\frac{1}{4}$ inch from the surface, and the result was that all the points were ground down in a short time to the surface of the ball.

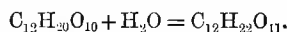
PLANT AND ANIMAL NUTRITION.

All feeding-stuffs are composed of six constituents—water, carbohydrates, fibre, fat, albuminoids, and ash, and it is by the comparative percentages of these elements that a food is judged. In plant formation there are eleven elements employed, and by the combination of two or more the above groups of compounds are formed. The necessary elements are: carbon, oxygen, hydrogen, nitrogen, iron, calcium, magnesium, potassium, phosphorus, chlorine, and sulphur. In many kinds of food the water is the largest constituent. For instance, in young clover as much as 92 per cent. of the whole is water. In the plant it is absorbed from the ground, and, constantly rising throughout the whole structure, carries with it other soluble plant foods in the form of sap. But, in addition, the water is decomposed, and, by a rearrangement of its component parts with one of the elements in carbonic acid gas, a new substance is formed. The work of compound-making takes place in the cells of the plant, these being small closed sacs walled with cellulose, and containing protoplasm (the life of the cell), chlorophyll, and other substances. The chlorophyll is the green covering matter, and is only found in parts accessible to sunlight. Its use is to break up the carbonic acid gas—which is taken in by means of

stomata on the under surface of the leaves—and the water of the sac, to form out of the elements thus set free a new substance called starch, bringing about this change with the liberation of free oxygen. The following is the reaction:



Not only is a new compound formed in the plant, but the air made impure by the presence of carbonic acid gas derived from the lungs of mammals is purified, and thus the balance of Nature is maintained. The starch formed is of no use to the plant at the place of manufacture; therefore, by the action of the protoplasm contained in the cell, this starch is converted into sugar by the addition of one more part of water:



Sugar, being soluble, is carried to the growing point either for the formation of the cellulose walls of new cells, which in the food is the fibre, or, if the plant is mature, for storing in the seed as starch. Both cellulose and starch being formed by the loss from sugar of one part of water, they contain the same elements as sugar, but arranged differently. The starch belongs to the carbohydrate group.

It will have been seen that the carbohydrates are formed of carbon, hydrogen, and oxygen, and that the two latter are always in the same proportion as in water—namely, two parts of hydrogen to one part of oxygen; but there is another formation of these three elements where the hydrogen predominates over the oxygen, and, moreover, the carbon is in greater proportion. These compounds are the oils or fats, of which there are many. One, stearin, is formed of $\text{C}_{57}\text{H}_{110}\text{O}_6$, an example showing the difference in composition. By experiment it has been proved that 1 pound of plant oil contains as much carbon as 2.29 pounds of starch. That fact is important when we consider the feeding value of foods.

The next group of compounds is the nitrogenous. These substances are called protein compounds, and are of great importance. They are formed by a rearrangement of a starch derivative, together with nitrogen and sulphur, these latter having been taken up by the roots in the form of nitrates and sulphur compounds. There are two forms, one insoluble, like gluten in wheat, and the other crystalline. It is supposed that the latter in solution carries with it the former to the growing-point.

The last part of the plant to mention is the ash. This is the residue after burning, and consists of various forms that have been taken up by the roots and deposited by the evaporation of the water. The leaves usually contain a large amount, due to the excessive loss of water which takes place from their surface.

Thus far we have touched upon the formation of the various compounds that are found in all foods. Now we have to deal with their use to the animal body. The chief are the albuminoids, fats, and carbohydrates; of the others, the ash is of slight value owing to the presence of lime and other salts, but the fibre, as already explained, is almost untouched during the passage of the food through the digestive system of the fowl. The work of the nitrogenous or albuminoid part is for the formation of skin, horn, feather, muscle, and eggs; the carbohydrates for heat production; and the fat for this and also for giving oily secretions to the joints. The various changes through which the food passes during digestion are as follows: The food is taken through the mouth and passed by means of the œsophagus into the crop; here it is mixed with the secretion similar in many respects to the saliva of mammals, which acts upon the carbohydrates or starch, and converts this part into sugar.

villi, or organs in the walls of the intestine connected with the lymphatic system. After traversing that system it is poured into the blood in the jugular vein. When once in the blood the products of digestion are carried throughout the animal, to be used for all requirements of the body.

It has been stated that the value of a food depends upon the quantities of the various constituents in its composition. A comparison is made between the percentage of the nitrogenous and non-nitrogenous compounds; in other words, between the albuminoids on the one hand, and the fat and carbohydrates on the other, or, as it is termed, the albuminoid or nutrient ratio. But this is not all. It has been pointed out that fat contains more carbon in proportion to the carbohydrates, and, as the heat-producing force is determined by the amount of carbon present, owing to the heat produced by carbon and oxygen, every pound of fat has to be reckoned as 2.29 pounds of carbo-

	Water.	Albu- minoids.	Fat.	Carbo- hydrates.	Fibre.	Ash.	Digestible.			Organic Matter.	Albuminoid Ratio.
							Albu- minoids.	Fat.	Carbo- hydrates.		
Wheat ..	14.4	13.0	1.5	66.4	3.0	1.7	11.7	1.2	64.3	83.9	1 : 5.7
Bran ..	13.6	13.6	3.4	54.9	8.9	5.6	10.6	2.4	44.4	80.8	1 : 4.7
Thirds (fine) ..	12.5	14.6	3.4	61.6	4.7	2.9	—	—	—	84.3	1 : 4.7
Barley ..	14.0	10.0	2.3	66.1	4.9	2.7	7.7	2.3	56.1	83.3	1 : 7.9
Oats ..	14.3	12.0	6.0	55.7	9.3	2.7	9.0	4.7	41.8	83.0	1 : 5.8
Maize ..	14.4	10.0	6.5	62.1	5.5	1.5	8.4	4.8	57.8	84.1	1 : 8.2
Beans ..	14.5	25.5	1.6	45.9	9.4	3.1	23.0	1.4	43.6	82.4	1 : 2.0
Peas ..	14.3	22.4	2.0	52.5	6.4	2.4	20.2	1.7	49.9	83.3	1 : 2.6
Buckwheat ..	14.0	9.0	1.5	58.7	15.0	1.8	6.8	1.2	44.0	84.2	1 : 6.8
Rice ..	14.0	7.7	0.4	75.2	2.2	0.5	6.9	0.3	72.7	85.5	1 : 10.6
Dari ..	11.3	10.0	4.0	68.3	3.6	2.8	—	—	—	85.9	1 : 7.7
Skim-milk ..	90.0	3.7	0.8	4.8	—	0.7	—	—	—	7.3	1 : 1.8
Potatoes ..	75.0	2.1	0.3	20.6	1.1	0.9	2.1	0.3	20.6	24.1	1 : 10.1
Turnips or swedes	89.4	1.4	0.2	7.1	1.3	0.6	1.3	0.1	6.3	10.0	1 : 5.0

The food continues its way, the saliva still acting upon the starch, until it reaches the stomach; here another juice—the gastric—is poured in, which converts the insoluble albuminoids into soluble peptones. Passing still further, after being ground in the gizzard, the food reaches the small intestine, where, by means of two more secretions—the bile and pancreatic juice—part of the fat is converted into soap, that helping to emulsify the remainder; but, in addition, these juices have the power of acting upon any starch or albuminoid that has hitherto been left untouched. What little fibre or cellulose is affected is accomplished by means of organisms in the intestines. At this stage all the products of digestion are soluble, ready to be received into the blood, which is brought about in two ways—part is absorbed directly through the walls of the many small veins that intersect the wall of the intestine, the remainder being absorbed by means of

hydrates. Therefore, in tables of analysis giving the digestible percentage of the constituents the fat is multiplied by 2.29, and added to the carbohydrates, the proportion between the albuminoids and the final figure will give the albuminoid ratio.

ARTIFICIAL FOOD.

By artificial foods we do not mean manufactured foods, but those which fowls would not eat if they were in a natural state, such as grain, meal, etc. No one food is sufficient in itself. Not only should it be varied in order to induce animals to partake freely of the food, but in accordance with the climate and temperature in which they live. What is suitable under one set of conditions may be positively injurious elsewhere. We believe that Nature produces in every country the foods most suitable to the animals of which it is the habitat.

The above table gives the principal foods used for poultry and their values in constituent elements, for which we are largely indebted to Mr. Primrose McConnell's "Agricultural Note-Book."*

It is generally admitted that the ration suitable for laying fowls is that known as 1:4½, or 1:5, the former in summer, the latter in winter. Breeding and laying stock should always be in hard, lean condition. The meaning is that there shall be one part of albuminoids to four and a half or five parts of carbohydrates. In the last column in the above table we give the ratio of each of the foods named.

The result of this observation is to show that the best summer foods are oats, wheat, and buckwheat; for winter, barley, oats, buckwheat, and a little maize; for laying hens, oats, barley, wheat, and buckwheat; and for fattening, oats and barley, though these require the addition of fat and milk to secure the best results, and rice prepared as described in Chapter XVII. is a splendid food for ducks. Good sound food pays best, and over-sea grain which has been damaged either by heat or salt water should be avoided. The following are the weights of the leading grains and legumes:

Wheat	...	...	60 lb. to 63 lb. per bushel.
Barley	...	...	50 " 56 " "
Oats	...	...	38 " 44 " "
Maize	...	...	60 lb. " "
Buckwheat	...	...	36 lb. " "
Peas and beans	...	...	63 lb. to 65 " "

There are 8 bushels to the quarter, by which grain is generally sold. Rice and all meals are sold by the ton or hundredweight.

It may be here observed that there has been a tendency of late years to rely too much on starchy foods, which are very liable, especially when fowls are in complete or semi-confinement, to cause internal fat, and for this reason a greater amount of meat is necessary. Properly cooked flesh given in moderate quantities avoids this danger, but it must not be given raw, and should be in sweet condition. In a later paragraph this subject is further dealt with.

A very valuable article of food for poultry, but which is usually wasted, is fresh bones. They contain 3 to 4 per cent. of nitrogen, 49 per cent. of lime phosphate, and 9 to 10 per cent. of carbonate of lime, and thus are especially valuable for growing stock and laying hens by reason of the soluble lime elements in them. In practice bones are found to promote laying without being stimulating, and may be given freely two or three times a week. They should be broken up fine, and in America many poultry-keepers buy fresh bones from the butchers for their poultry. Mills

* The albuminoid ratios are taken from the digestible constituents wherever possible, but not in the cases of thirds, dari, and skim-milk.

are sold for the purpose of cutting up the bones to a proper size (Fig. 72).

SOFT AND HARD FOOD.

The system of feeding is to give soft food—*i.e.*, meals, etc., mixed with water—in the morning, and hard corn about an hour before the birds go to roost, which can be recommended. The reason for this is that, after the long fast of the night, if hard corn be given, it takes some time to digest, and thus it is a considerable period before the birds obtain the benefit thereof. Whereas if soft food is given, it passes rapidly through the crop and is assimilated in the gizzard, these organs having comparatively little work to perform. On the other hand, if hard corn is given at night, this takes longer in digestion, more especially

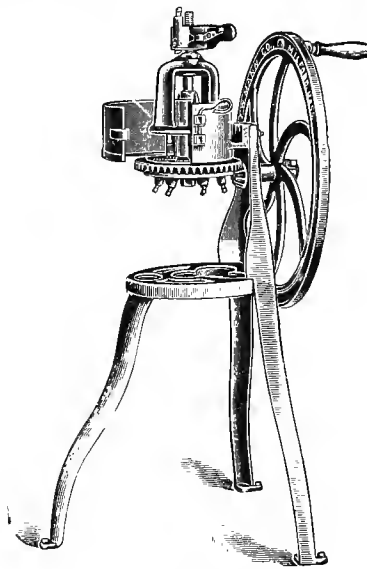


FIG. 72.—BONE-CUTTER.

as the fowls are at rest, and thus it serves them until the morning. In summer the plan here recommended is of lesser importance, as the birds are out early and can obtain some food, so that they are not really so hungry when they are fed.

Soft food should be always cooked or mixed with boiling water. We prefer the former method, as cooked food is more digestible, but not many people take so much trouble. Where only a few fowls are kept, an excellent plan is to have a stock-pot, into which scraps of all kinds, inclusive of bread, meat, vegetables, potato-peelings, etc., can be placed. It must be remembered that we should not use too much in the way of meat or fat, but ordinary judgment will enable the poultry-keeper to regulate this matter. Each evening a sufficient quantity of water should be added, so as to

bring it up to the amount likely to be used in mixing the food next morning. The pan may be placed by the side of the fire and left there overnight. The contents will cook, and in the morning the only thing necessary will be to put it on the fire again for a short time to heat. This may be mixed with meal, and the whole makes a most appetizing morning feed for the fowls, especially in the winter season of the year. For larger establishments such a cooker as that shown in Fig. 73 should be employed, and we have used one of these excellent apparatus for several years with great advantage. The stove is slow in combustion, and will burn for several hours without attention. Our plan is to half fill the inner food-vessel, mixing the contents with water to the consistency of thin cream, in the evening, and by lighting the fire about 8 p.m. in the morning the contents are thoroughly cooked, and quite warm enough for the fowls. The great advantage of these cookers is that the fibre in the hard vegetable matter, tubers bran, etc., is broken down, and often



FIG. 73.—PARISH'S COOKER.

forms a cheap and valuable food. It may be explained that if meal be mixed with cold water not only is it less digestible, but also the body-heat is consumed in raising the moisture to the temperature of the fowl, and thus it is chilled instead of warmed by the food. Better give hard corn always than mix meal with cold water.

One of the best ordinary soft foods is a mixture of barley-meal or ground oats and middlings (fine thirds), half of each in winter and one part of barley-meal to two parts of middlings in summer. It must always be made crumbly moist, never sloppy. Another good morning feed for adult stock is to mix equal parts of whole wheat, buckwheat, and maize, boiled and mixed with 10 per cent. of meat, the moisture being dried up with sharps.

FOOD TABLES.

The following tables will give suitable mixtures for regular feeding of breeding or laying stock :

(a) Summer.

Soft Food—

Barley-meal	1 part.
Fine thirds or middlings	1 „
Turnips (cooked)	2 parts.

Or,

Barley-meal	1 part.
Fine thirds or middlings	1 „
Potatoes (cooked)	2 parts.
Clover-hay chaff	1 part.

(Albuminoid ratio of above, 1 : 4.5.)

Hard Food—

Equal parts of oats and wheat.
(Albuminoid ratio, 1 : 5.8.)

(b) Winter.

Soft Food—

Indian meal	3 parts.
Pea-meal	1 part.
Barley-meal	3 parts.
Bran	1 part.
Potatoes (cooked)	3 parts.
Meat (granulated)	$\frac{1}{2}$ part.

(Albuminoid ratio, 1 : 4.8.)

Hard Food—

Equal parts of wheat and barley.
(Albuminoid ratio, 1 : 6.6.)

HOW TO FEED.

Fowls at liberty should only be fed twice a day, except when the ground is hard with frost or covered with snow, when a little corn and vegetables may be given about noon. This is always necessary when they are in confinement, when it is also desirable to dig up a portion of the run, giving the birds a place in which to scratch. The best method under all conditions is to feed from troughs similar to that shown in Fig. 74, the top rail being designed to prevent the fowls walking over the food, and also serves the purpose of a handle. Fig. 75 is a metal trough with lifting railed cover. Throwing food down upon the ground is wasteful, and it is frequently contaminated if lying there for any length of time, and a great amount of food is often consumed by wild birds to the loss of the poultry-keeper. The great secret is only giving as much as the fowls eat eagerly. Feeding to repletion is always bad, and, as doctors tell us, we should rise from the table with an appetite—i.e., not actually hungry, but feeling that we could eat more if we wished—we should apply the same rule to our fowls, and the doing so will be an effectual prevention of overfeeding, with its subsequent evils. Consequently, any food remaining should be removed as soon as the birds are satisfied.

The above recommendations should be modified

according to the natural food available, and no hard-and-fast rule can be laid down. Such food as is supplied should be supplemental to, and not in place of, what can be obtained by the birds themselves. If we supply all the fowls require, they have no need to forage, and the latter should be encouraged both for economy and the benefit accruing to the stock. At certain seasons of the year one feed per diem is ample, by reason of an abundance of natural food. With birds at full liberty we have adopted the plan of giving in the morning only a half-ration—that is, half as much as the birds would eat—of soft food, and they are then seen to scatter themselves all over the fields in search of more, obtaining a large amount of exercise thereby. At night a full feed of corn is given. Where scratching sheds are used (see Chapter VIII.) the grain is scattered among the straw or chaff.

WATER.

Water is a most important part of the diet. A running stream solves the difficulty at once. Disease is often caused by impure water, disease of the most subtle and deadly character. Water should be often renewed in fountains, but if in open troughs these should not be exposed to the sun. Very often the water-supply for fowls is regarded as a minor consideration, but it has much more to do with their

chicks dainty bits, to be constantly feeding them on rich morsels, with the result that they are often killed by kindness. The plainer the diet the better, and anything in the shape of forcing is sure to cause harm. Thousands of chicks die every year from no other cause than that they are overfed or fed on too rich food. Where death does not result, the seeds of disease are sown, and sooner or later these seeds are developed, and trouble is the result.

We have already described the dry system of feeding, in Chapter XII., and refer the reader thereto. Under the ordinary method, as soon as possible we believe in giving hard grain as part of food, when it is intended to rear the fowls, and not kill them at an early age. But judgment is needed to decide when this

can be safely done. We have found that most chickens cannot take whole grain—by which we do not mean small seeds—until they are nearly three weeks old. There is nothing better than the foods already mentioned, which have all the elements of successful chicken-rearing. When the birds are about sixteen or eighteen days old, they may have a little *dari* or crushed buck-wheat, which may be gradually increased until the soft food is only given once a day. Occasionally, in cold or wet weather, a little crushed or whole hemp-seed may be given; but that seed is very rich, and should be used sparingly. Of course, when the chicks

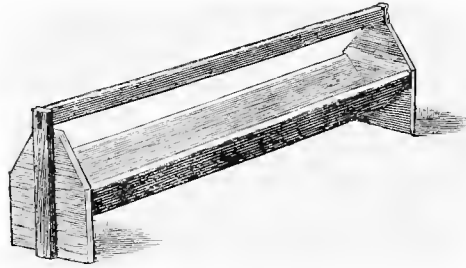


FIG. 74.—WOODEN FOOD TROUGH.

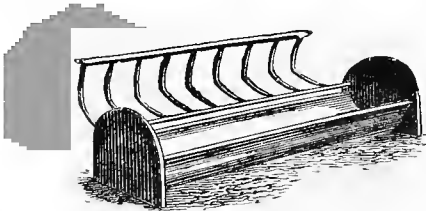


FIG 75.—METAL FOOD TROUGH.

health than is generally supposed. Fig. 76 shows an excellent form of fountain. When these appliances are used, they must be kept clean, or they soon become contaminated. If open vessels are used, they should be filled before feeding, and emptied soon afterwards.

FEEDING CHICKENS.

The question of feeding young chickens is all-important, for upon its food must depend whether the bird will thrive well, die a premature death, or be stunted in its growth. It will be well to say here that more harm is done by over- than by under-feeding, especially amongst small amateurs. They like to give

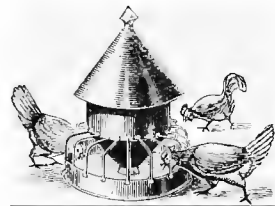


FIG. 76.—PENKETH'S WATER FOUNTAIN.

arrive at six weeks of age they may have small wheat and other grains that are not too large for them to swallow.

A word here as to the artificial foods sold will not be out of place. Spratt's Poultry Meal we have used for many years with unvarying success, and upon it chickens thrive amain, formed as it is of the very best elements, making a splendid combination for chicken-rearing. We can also recommend Chamberlain and Smith's Canadian Meal, Molassine, and Lambert's Cereal Meal, for this purpose.

The true secret of feeding young chickens is to give a little plain food and often. All young life needs its

nourishment to be frequently given; and chicks are like babies—they must be fed at short intervals. Under the dry system they eat when they like. Unless this is done, they are very apt to suffer and be stunted through hunger, and also to gorge themselves when the food is placed before them, the latter a state of things calculated to induce disease. The best chicken-raiser is the man or woman who can get up early in the morning, for birds require to have an early feed, as soon after daylight as possible. This feed should be a warm one. Young chickens under a month old should have a feed the last thing at night, say about ten o'clock. That will, of course, have to be given by lamplight, for only in the height of summer would there be daylight for the purpose. When the birds are over a month old, it will be sufficient if they are fed about half an hour before sunset. Troughs should always be used for feeding chickens, and they must

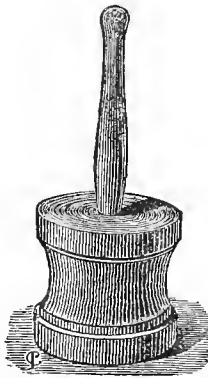


FIG. 77.—FEEDING-BLOCK FOR CHICKENS.

be kept thoroughly clean. Fig. 77 shows a French feeding-block for chickens, the food being piled up around the stick, so that the birds cannot tread it over, and they have to stretch up to reach it. A small trough may be used when they are a little older, similar to Fig. 74, but made lower. Water or sweet skim-milk may be given to chickens in suitable vessels, and are better if slightly warmed in cold weather.

TIMES OF FEEDING.

The times of feeding may be briefly described as follows: When the chicks are less than a fortnight old, they should be fed every two hours; for the next fortnight every three hours; and after that time until they are fully grown, say when four or five months old, four times a day. The plan we recommend is to cease giving the food as soon as the appetite is satisfied, which is especially necessary in the case of chickens. We always like to see birds ready for their meal when it is ready for them. That is a good sign of health.

SUBSTITUTES FOR WORMS.

Reference has already been made to the importance of insect and grub life for fowls. Where this kind of food is absent it must be artificially supplied. In the winter season there is nothing better than the prepared crissel sold by Spratt's Patent, which is very valuable for all kinds of poultry, and is a purely animal product, with a very small amount of fat. At other seasons of the year they can obtain that form of food in a natural manner. Dead fowls or other forms of flesh food can also be used for this purpose, and may either be buried under the ground or hung up. In this manner a most important element in the feeding of fowls can be provided for. It is desirable to state that under no circumstances should a diseased fowl be used in this way, as that would be the means of propagating disease; and it is also desirable that the supply of this kind of food be not excessive. If fowls are in a state of Nature, they have much more exercise than when in confinement, which is always to be taken into account in making comparisons between food obtained under the two conditions.

GREEN FOOD.

No mention has been made of the importance of green food to the young chickens, but it must not be lost sight of. The sweet juices of young grasses or vegetables have a wonderful effect on the economy of fowls; and though we do not say that chickens cannot be reared without one or the other, we do not think that they can be so reared with the same amount of success. Wherever a good grass run can be given, it is desirable that the birds have the benefit thereof; but it cannot be regarded as essential where tender vegetables, especially lettuces, can be provided. Where fowls have been kept on ground for several years without its being renewed, the grass may be positively injurious instead of beneficial, but with lettuces this will not be so. The poultry-breeder will do well to grow as many of these succulent vegetables as he can, and freely give them to the chickens. Other kinds of vegetables may be used, and in winter-time roots are of great benefit, the latter being given mixed with the soft food. In this way turnips, swedes, beetroot, and potatoes are all valuable. Potatoes and beetroot should be cooked, but turnips and swedes may be cut in two and given the fowls to peck at in a raw state.

OBJECT IN FEEDING.

The remarks which have been made as to the feeding of chickens are intended specially to apply to such birds as are bred for layers or stock fowls. The object with these chickens is to secure a strong frame and good constitution, for which purpose the food must contain all elements for bone and muscle formation, as well as for the making of flesh. When chicks are

being reared for the table, and will be killed off ere they are ten or twelve weeks old, a different method must be adopted in order to secure success. The object in this case is to secure the maximum of flesh with the minimum of bone and offal; therefore it is necessary to feed with other foods than those already named; and in this case a little forcing is desirable, in order that the birds may be brought to maturity as speedily as possible. After the first fortnight of the chick's life, instead of using grain, soft food should be given as the staple, and, in order to induce the birds to eat as much as possible, their food should be well varied. One good food is a mixture of

barley-meal, oatmeal, thirds, and Indian (or maize) meal, with some lean meat and a little stimulating powder, such as Thorley's "Ovum." There is also the common rice, known in this country as poultry rice. This, if properly prepared—namely, slowly simmered by the side of a fire, with plenty of water in the pan—makes a splendid food, as it contains flesh-forming elements to a large extent, and scarcely any bone-forming materials. The breeder should therefore know what he intends to do with the chickens, and in this way be guided as to his manner of feeding them. The entire question of fattening is dealt with in a succeeding chapter.

CHAPTER XV.

POULTRY-FATTENING.

FATTENING A METHOD OF RIPENING—FOOD TO BE USED—FATTENING INDUSTRY—CAGES—SHEDS—CRAMMING—
VARIOUS METHODS—FOOD FOR FATTENING—FEATHERS AND MANURE—SUMMARY.



FATTENING is really a method of ripening.

Fat or oil laid upon the various tissues throughout the body softens, and has the effect of making them more tender. This is the same process found working in all Nature. Fruits fill out, and are plumpest and sweetest when they ripen. In both cases the ripening, if continued too long, tends to decay; but it is just as reasonable to say that grapes are not good to eat at their prime, because if allowed to hang longer they go bad, as it is to say that the fact of a fowl going back if fattened too long is a proof that fattening is a wrong system. We have also heard it stated that, because fattened fowls are not fit for breeding, therefore no fowls should be fattened at all. This is a nonsensical argument. No one can be more opposed than we are to the over-feeding of breeding stock, for we believe that breeders and layers should be kept in rather poor condition, but at the same time we realize the value of fattening for fowls destined to immediate slaughter. This immediate slaughter is absolutely necessary when birds have been fed up in the way named, for the fat upon their tissues clogs them up and prevents the organs performing their functions properly, so that diseases of various kinds are soon generated. The great Liebig was accustomed to say that all fat is a disease, but this had reference to human beings, who are not intended for slaughter, and his dictum must not be regarded as applicable to the preparation of table fowls.

FATTENING.

In fattening poultry, or, in fact, any other animals, two things are absolutely necessary—first, that the food supplied shall tend to the production of flesh; and, second, that the conditions under which fowls are kept shall eliminate as little of the oil or heat fuel as possible. And it may be well here to explain that, although the term “fattening” is employed, we do not mean by it mere laying on of an excessive quantity of fat or oil, such as was at one time the case with cattle and sheep,

but the addition of the fat is necessary, with as much flesh as can be obtained. Fat, as already explained, softens the flesh, ripens it, and herein its value consists. The reason why the flesh of a ripened fowl is finer in flavour, and more digestible, is that fat takes the place of water in the tissues. This, when cooked, melts and softens the flesh, whereas water evaporates and leaves it dry and harder. Professor Warrington, F.R.S., calls attention to the fact that the rates of consumption and of increase are very different in different states of the period. As a fattening animal increases in size the quantity of food it consumes also somewhat increases; the stomach at the same time becomes larger. When the animal becomes very fat, the consumption of food falls off again, and the rate of increase at this point is much diminished. As fattening advances the daily increase in live weight becomes gradually smaller, and the same amount of food will produce a steadily diminishing amount of increase.*

THE FATTENING INDUSTRY.

Prior to the time when the first edition of “Poultry-keeping as an Industry” was published, the fattening of chickens was restricted to the counties of Sussex, Surrey, and West Kent, where it has been carried on for a very long period. In the South-East of England the rearing and fattening of fowls has been among the most profitable branches of rural economy, as shown by the evidence obtained for the Royal Commission on Agriculture. It is estimated that there about 3,000 tons of chickens are marketed annually, in value about £500,000 sterling. So great is the demand that local supplies do not suffice. Vast quantities of Irish fowls are brought over every season, in some years numbering 300,000. Complaint is made by the fatters that they have to pay such high prices for the lean birds that their profits are greatly reduced, but the evi-

* “Chemistry of the Farm.” London: Vinton and Co., Limited.

dences are the fatters make this business pay. It is no uncommon thing, however, for higglers to give up to 3s. 6d. each for early-hatched, well-grown chickens of eight to ten weeks old. One result of the increased attention given to poultry culture is seen in fattening establishments, which have been commenced in several other parts of the country. Of course, these have had to meet with the usual difficulties incidental to the commencement of any new industry, but with perseverance they will succeed, and form an important outlet for the local produce securing better returns for breeders. To those who object to the fattening system, it may be pointed out that we are simply applying to poultry the same principles as adopted in connection with larger stock, and that it is as foolish to kill lean fowls as it would be to slaughter store cattle or sheep. In three weeks from $1\frac{1}{2}$ pounds to 3 pounds can be added to the weight of any ordinary-sized fowl, largely a gain in flesh, and at a cost of about 8d., the improvement in quality of flesh and general appearance being very great.

Whilst it is true that in France the work of fattening is usually carried out by those who rear the fowls, it must be pointed out that, as a rule, French farmers' wives and daughters are more skilful in poultry management than is the case here, and at each place not more than 200 to 300 are marketed in the course of twelve months, the system of disposing of the produce being different. In this country the work of rearing and of fattening is generally dissociated. Fatters scour the district around for birds to fill the cages, buying from the farmers and cottagers who rear them. Carts loaded with pens of fowls form a common sight in Sussex and West Kent, to be met with on every road and lane. Sometimes a man may be met with a cage upon his back, used for by-roads, and he meets the cart at a determined point. These back-cages are made curved, and hold a couple of dozen birds, built in two tiers. When loaded they are no light load. The higglers know just where to go, and when a supply of chickens

will be ready for them. Sometimes half a dozen of these collectors will call at a cottage in one day. The reason why fatters depend upon rearers rather than their own breeding must be evident upon consideration. If we take an ordinary establishment, with accommodation for fifty dozen birds, and assume that all the cages will be filled during the busy six months of the year, and half filled during the other six months, it will be seen that 23,400 fowls will be dealt with in the course of twelve months. To breed this number would entail an amount of labour and oversight which would alter the character of the enterprise entirely, and

hence it is found better to buy from others. Moreover, there is less danger of disease than if large numbers of chickens were reared on the same ground. But it must be stated that more is being done by fatters in the way of breeding than was formerly the case.

FATTENING CAGES.

There are many different methods adopted by fatters, but one general idea seems to prevail. During the milder months of the year many fowls are partly, and some-

times wholly, fatted in outside cages, placed under the lee of some hedgerow, or where they can be protected from wind and rain. In the Uckfield district of Sussex and in Kent a large amount of fruit is grown, and these orchards are utilized for the accommodation of outside fattening cages. Fig. 78 shows an example, copied from a photograph. These outside pens or cages, as, in fact, are those inside also, are very simply made, consisting of laths of wood, generally about 1 inch wide and $1\frac{1}{2}$ inches apart, except the bottoms, which have the laths narrowed below, so as not to catch the droppings. Each cage should be 16 to 18 inches from back to front, and the same in height, divided by laths into compartments of 15 inches, holding two birds. To each compartment is fitted in front a sliding door. The cages, which are usually in single tiers, are raised about 3 feet above the ground upon what are called stages—cross-pieces of scantling, sup-



FIG. 78.—OUTSIDE FATTENING CAGES.

ported by posts fixed in the ground. In not a few instances everything is of the simplest and cheapest description, and the opportunity is taken of a slack season to put together what further cages are likely to be required either for renewal or extension of operations. They are also made and supplied at reasonable prices. Shelter against wind and rain is most important. A thick hedge is very serviceable against wind, but the tops of the cages should be covered in with a slooping wooden or corrugated iron cover, or branches of trees, which are regarded as best of all, by reason of the fact that they are coolest, allowing for the circulation of air. In front is fitted a long wooden

off completely; and in summer there is very little demand for fully-fatted specimens.

THE SHEDS.

When the birds have been fed from a week to ten days from the troughs, if it is intended to finish them fully, they should be removed to covered sheds, of which there is a great variety. Some are very rough indeed, and evidently built with the one idea of cheapness, whilst others are of a more complete type. In not a few cases barns and other buildings have been adapted to the purpose of fattening sheds, and where this is done they are loftier and warmer during severe



FIG. 79.—IVILLE FATTENING SHED.

trough, made V-shaped, and suspended by cord or resting upon supports, in either case easily removable. The system here described is an excellent one in the milder months of the year, and where there is a fair amount of shelter, but would be unsuitable in the cold season, especially if the district is a bare one.

The usual plan is to keep the birds in these cages for from a week to ten days, feeding them twice a day from the trough. Large numbers of birds are never crammed, but supply a demand for half-fatted chickens, and it is wise to keep this trade in view. The birds are considerably improved as compared with the lean specimens, and should command better prices. In many districts it will be well at first to supply half-fatted chickens until there is an inquiry for those finished

weather than is possible with wooden erections. As examples may be mentioned that owned by Mr. C. E. Brooke, Past Master of the Poulterers' Company of London, at Baynards, Surrey (Fig. 79), consisting of a thatched barn, and one of the best-equipped establishments we have met with either at home or abroad; it is roomy and well ventilated. In this case the cages are built in three tiers, but we prefer single rows, which is the usual plan. At Theale we have erected a wooden shed 40 feet by 14 feet, with large folding doors at either end, and 8 feet high to the eaves. As a rule, cages are only used in single tier at the sides; but there is room for a double row down the centre, and it has a capacity of nearly 500 birds. Examples of specially-built fattening sheds are given in

Figs. 80, 81, and 82, the last-named of which has been erected to our own designs, and combines protection sufficient to ensure success, and gives proper ventilation. It may be extended to any size, and has the added advantage of being removable, should occasion require.

There are, however, some fatters in Sussex who do not use sheds at all, but fatten entirely in the open air, giving such shelter as may be obtained from hedges and a rough board covering. At the establishment of Mr. Oliver, near Heathfield, long sheds are employed with open ends. What may answer in a warm situation is inadvisable elsewhere, and it is safer to have a good large enclosed fattening shed. This is the plan adopted in France and Belgium, but in both those countries the buildings are often by no means as roomy as could be wished, and we have visited places which compared unfavourably with the better type of Sussex sheds. A very serious objection to the keeping of fowls throughout the fattening process in the open air is that they take longer to fatten, except in mild weather, the reason for which must be obvious. If exposed to cold, the birds consume more food as fuel, they are more restless than when in a quiet place, and there is

great danger of disease resulting from bad weather. Of course, the sheds must be properly ventilated, and it is desirable to have large doors at both ends, so that in warm weather there may be a good circulation of air. Under ordinary conditions, it is found that the best results are obtained if the fattening cages are in single tier, because they can be more easily cleaned; but in the Baynards shed, and also that at Gambais, three tiers are used. In the latter cases the pens are rather more elaborate, each bird being provided with a separate compartment. Below every row of six cages is fitted a sliding tray, upon which dry earth, sand, or peat-dust is sprinkled, to catch the droppings, which are removed every day. Unless the most rigid cleanliness is maintained, this system would soon cause disease. Whatever the form of pen employed, it is necessary to remove the droppings daily, to lime-wash the house out frequently, and to treat the pens in the same manner

between each occupancy. An excellent plan when cages are in single tier is to have a sloping board below the pens, sprinkling upon it fine earth and lime, and scrape it down daily. The use of powdered lime, disinfecting powder, or a solution of permanganate of potash, is advisable, in order to destroy microbes. It is impossible to lay too much emphasis upon cleanliness in the fattening sheds and cages, whether in the open or under cover.

CRAMMING.

The methods of fattening adopted are four in all: (1) From the trough; (2) by hand; (3) by funnel; and (4) by machine.

1. This system has been already referred to, and it is chiefly employed for the production of half-fatted specimens, which may either be kept in the ordinary pens or in a house and run similar to that shown in Fig. 83, which can be moved on to fresh ground as often as necessary. It will be seen that it is fitted with troughs at either side. One of these appliances, 6 feet long by 3 feet wide, is large enough for a dozen birds, and it is a suitable form for ordinary farmers. In Belgium the famous Coucou de Malines are fatted

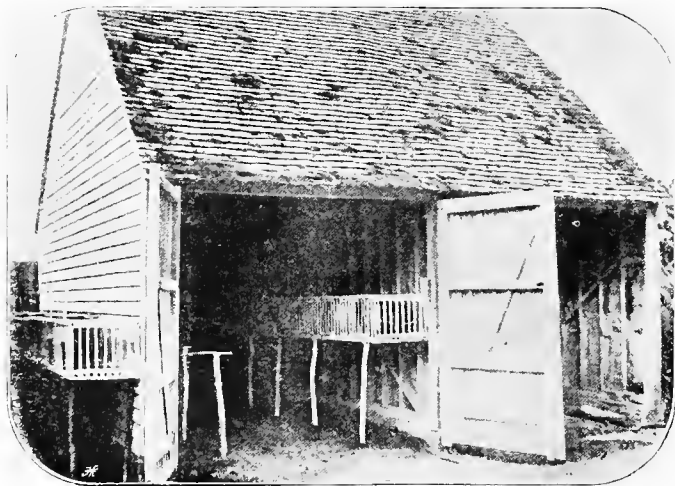


FIG. 80.—MARTEN'S FATTENING SHED.

entirely from troughs, but they are kept in closely-covered sheds during the entire process.

2. Some of the finest fowls which are produced both in England and France are crammed by hand; but the process is slow, so that it is only suitable where labour is abundant and cheap. In a large establishment it would be impossible to get through the work if hand cramming were depended upon. The food is mixed to a thick paste, and formed into pellets or boluses about $\frac{3}{4}$ inch in length and $\frac{1}{2}$ inch thick. There are two ways in which feeding takes place. In the one a sufficient number of the boluses are prepared, and the operator takes hold of the bird's head, either in the pen or out of it—in the latter case firmly gripping it between his body and left arm—opens the mouth with the thumb of his left hand, dips the bolus into a vessel of whey or milk, inserts it into the mouth, presses it down the throat with his finger, and then carries the food into

the crop by running his finger and thumb down the outside of the gullet. The second plan varies somewhat. The operator sits upon a stool, with a lot of the paste and a bowl of whey or milk before him. The bird is placed upon his knees, its legs held firmly by them, the left hand holding the wings, and he places a small quantity of the food, after dipping it in the milk, into its mouth, allowing it to swallow in the usual manner, there being no actual cramming. Both these methods are very simple. In some instances a combination of the two methods is adopted. The birds are kept in cages, to which are fitted troughs. After each meal the attendant goes round, feels the crop of each

a reasonable price, and splendid quality of flesh is produced in this manner.

4. Cramming by machine is found to be the most expeditious, and the first cost is speedily saved in the labour bill. We have seen an operator feed 250 birds in an hour, so that the duration of insertion is very short. Many people have the idea that this system is a cruel one, but it is not so. A careless or inexperienced operator can hurt the subject, but it does not pay him to do so, as any injury to the throat or mouth would cause inflammatory action to be set up, and it would die. The tube which passes down the throat is made of indiarubber, is flexible, and as the cartilaginous

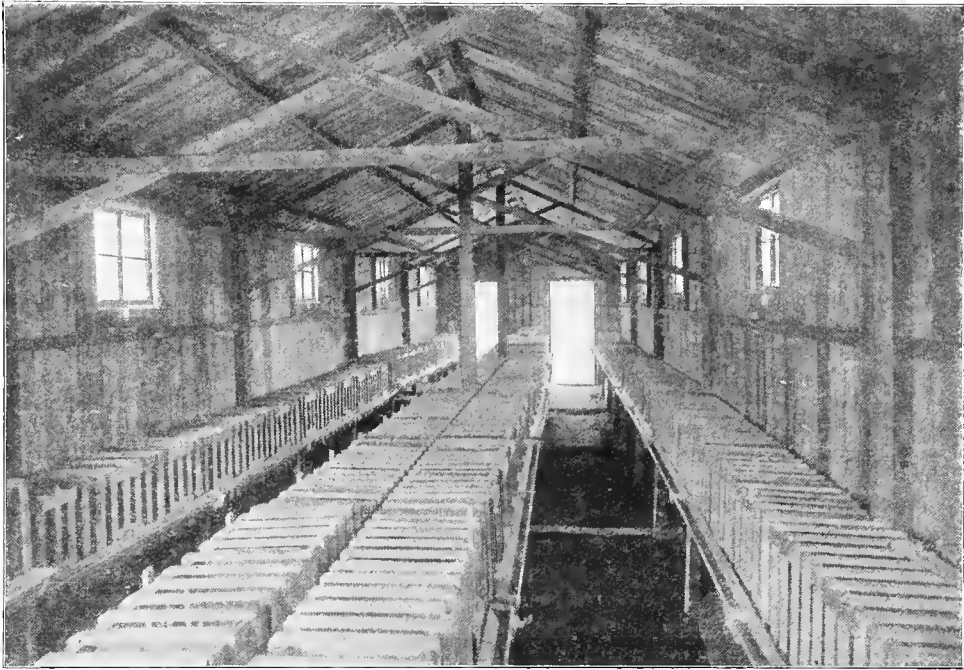


FIG. 81.—INTERIOR OF FATTENING-SHED, CHEARSLEY HOUSE, AYLESBURY.

fowl, and then crams a few of the boluses whenever it is thought necessary to do so.

3. Cramming by funnel is largely carried out in Southern Normandy. In this case the food is made into liquid form, about the consistency of ordinary cream. A specially made funnel (Fig. 84), the nozzle of which is carefully turned to prevent injury to the bird's throat, is inserted into the gullet until the orifice enters the crop, which can be felt by the finger, and the food is spooned therein until the crop is full, when the funnel is withdrawn. In operation the process requires a much shorter time than it takes to describe, but care must be taken, or there is great danger of choking the fowl. These funnels can be purchased at

rings of the neck are flexible, it enters quite easily. The way in which the fowls anticipate the feeding-time, after the first day or two, shows how they regard the operation. The machines employed are: (1) the Neve (Fig. 85), which is largely used in Sussex. It has a horizontal cylinder, and is operated by a foot lever, but as there is no spring to draw the pedal back again, this must be done by the foot before the tube is withdrawn, otherwise the food will be wasted. (2) The Hearson (Fig. 86), of which the following is an explanation: A is the reservoir for the food; B, the pump cylinder; E, the piston rod; G, the spring bringing foot pedal and piston back again; K, nozzle and food tube; M, stop for regulating quantity of

food; O, lever and treadle. For use in these machines the food is made semi-liquid, about the consistency of very thick cream, which is placed in the reservoir. The operator moistens the tube with milk to make it pass easily, takes the tube in his right hand, the bird's head in the left, the bird itself being held firmly under the left arm; then, with the assistance of the finger and thumb of the right hand, opens the bird's mouth, and slips the forefinger into it to hold down the tongue, quickly inserts the end of the tube, and, holding the neck perfectly straight at its full length, pushes it down 4 or 5 inches (according to the size of the bird); at this

moment the heel of the right foot, which up to this time has been resting on the treadle, is depressed and forces the contents of the cylinder into the crop until it is sufficiently charged. If the crop is full enough, the tube may now be withdrawn, care being taken, however, to relieve the pressure on the treadle for a second or two before taking the tube out, otherwise a small quantity of the food will continue to flow after the tube is removed. The quantity of food can be regulated to a nicety, and the great thing is to cease pressure the moment sufficient has been placed in the crop. A most important point in connection with the

fed in pens without taking them out, the liquid flowing when the spring is released. In this case the nozzle is only placed into the mouth, not passed down the throat. The head must be held well up and the

neck stretched to allow easy swallowing.

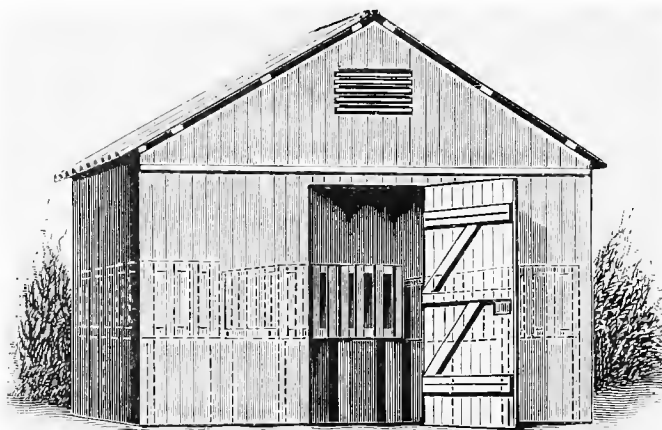


FIG. 82.—MODEL FATTENING SHED (REGISTERED).
(W. Calway, Sharpness.)

FOOD FOR FATTENING.

The food supplied to the fowls during the process of fattening is of very great importance, and upon it must depend both the quantity and flavour of the flesh. This must always be soft food, and never hard corn, as the latter would take longer to digest from the fact that the birds are in confinement, and would

not give the same results. The reason why animals fatten better at rest is well explained by Professor Warrington, F.R.S. He says that economy of food is promoted by diminishing the demand for heat and work.

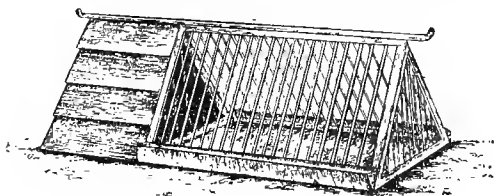


FIG. 83.—PORTABLE FATTENING SHED.

fattening of poultry is to give the food regularly, and if there is any remaining in the crop from the previous meal, not to give any at all. Several of the French cramming machines are for liquid food, and attached to them is a long piece of indiarubber tubing, fitted with a spring tap or nozzle, so that the birds can be

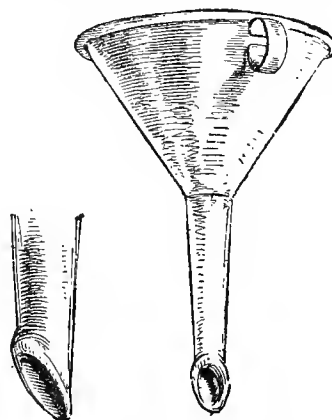


FIG. 84.—FUNNEL FOR CRAMMING.

An animal at rest will increase in weight far more than an animal taking active exercise on the same diet. In the same way the increase from a given weight of food will be less in winter than in spring or autumn, a far larger proportion of the food being consumed for the production of heat when the animal is living in a cold

atmosphere. Hence the economy of feeding animals under cover during winter. If, however, the temperature becomes so high as to considerably increase the perspiration, waste of food again takes place, heat

of the greater amount of lime in ground oats they produce the finest flesh.

USE OF MILK.

With the meal should always be mixed soured skim-milk, butter-milk, or whey from the curds. In Sussex the first named is alone adopted, and one of the largest fatters sometimes pays as much as £20 in a week for milk during the busy season. Whole milk would not only be more expensive, but the globules of butter-fat in it are too valuable, and can be substituted at a much cheaper rate. Surprise is often expressed that soured rather than sweet milk should be used. In practice it is found that the former gives the better results, the acid generated by the turning of either milk, butter-milk, or whey, causing more rapid action than would be the case if it were sweet. Not only is the milk itself soured, but when mixed with meal, as is usually done immediately after one time of feeding is over, it is allowed to stand for several hours, until a slight fermentation has taken place. There are distinct disadvantages from the giving of soured milk, and one is that there is always a greater tendency on the part of the birds to scouring; but fatteners who have tried both systems declare that the soured skim-

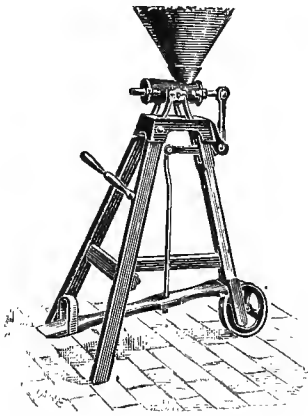


FIG. 85.—NEVE CRAMMER.

being consumed in the evaporation of water. The temperature most favourable for increase is apparently about 60° F. Quietness and freedom from excitement are essential to rapid fattening; the absence of strong light is therefore desirable.*

In Sussex and the South-Eastern counties the food almost entirely employed is ground oats, which is largely prepared in the Valley of the Medway, millers there making a speciality of this product. There is no reason why it should not be produced elsewhere. It is necessary that the stones shall be sharp and run very low. Ground oats must not be confounded with oatmeal, as they have not been kiln-dried—at any rate, to the same extent—but are fresh oats ground very fine, husk and all. It is found in experience that English and Scotch oats are unsuitable for this purpose, as they contain too much moisture, and will not grind fine enough unless they are highly kiln-dried. Consequently the plump, hard Russian oats are preferred, and from them the best samples are produced. The usual price for pure ground oats ranges from £9 to £10 per ton, varying in accordance with the market rates for oats. Cheaper kinds are often sold, but these are usually adulterated with fine thirds, and it is better to obtain the purer, even though the cost may be higher. A mixture which is often employed consists of one part ground oats, one part fine Indian meal, and one part fine sharps, costing about £6 10s. per ton. In Belgium finely-ground buckwheat is universally used, giving good results, and in France buckwheat-meal and fine barley-meal are largely employed, both of which are very good, but by reason

* "Chemistry of the Farm." London: Vinton and Co., Limited.



FIG. 86.—HEARSON'S CRAMMER.

milk yields the better results, in that the birds will eat longer and digest their food more quickly than if sweet milk is employed, and at the same time there is less danger of what is known as crop-sickness. It is claimed

that the acid generated in the milk has the tendency to prevent sickness, and also stimulates the appetite, and there seems to be a considerable amount of reason for this statement. A further advantage to the fatterer, is that he has not the same necessity to obtain his milk just at the time when it is required, and, in fact, in many of the fattening establishments great vats of milk are allowed to stand for weeks before it is used, buying up when they can get it, and using as required. Milk contains a large amount of phosphates, which have the effect of whitening the flesh. Not only is this true in respect to chickens, but also ducklings and goslings, and most of all turkeys. The use of milk at the time of feeding off the turkeys before killing is found to result in beautiful colour of flesh. Milk is one of the most valuable foods we have, and in some parts of the country, the dairy districts especially, skim milk is almost a waste product. If fattening establishments were found there, or within a reasonable radius, it might thus be used. Butter-milk does not appear to yield quite the same results. It contains a little more in the way of fat, and is somewhat richer, but, as already stated, it is employed in Belgium, and might be used wherever it is available in this country. Mr. Lewis Wright* makes a very interesting suggestion as to soured skim-milk: "The sour milk keeps the digestive organs in proper activity, without the use of fresh vegetables, which would otherwise be necessary. Tell a Sussex fatter to use 'boiled milk,' and the green food which would then be required, and see what he would say."

FAT.

A question is frequently asked as to what influence the increase of fat upon animals and birds, which are specially fed for table purposes, has so far as the edible qualities are concerned, and it may be of service if this is clearly explained. The contention which is often put forward, that whenever fattening takes place there must be a certain amount of waste, cannot be questioned. It is impossible, when we develop the proportion of fat in the flesh, that we can confine this only to the parts of the body which are consumed as food, because the entire body is affected. In fattening, whilst the muscle is increased largely in bulk and weight, there is at the same time a considerable distribution of fat on the intestines and internal organs. Whilst acknowledging thus much, it is equally true that the greater part of the fat which is added to the food during the preparation of table poultry is beneficial, in that the globules of fat are distributed through the muscles upon the body, increasing these in bulk, adding greatly to the weight of the bird, and at the same time improving both the colour and quality of the flesh. If we take any animal or bird in lean condition, and feel the muscle, it is

hard, whereas when the animal or bird has been fattened the muscle is soft, but more bulky. For fattened birds we do not require hard muscle, however desirable it may be when the animal or bird is in working order, but it is necessary that the muscle shall be what has been termed "soft." A mistake is frequently made in respect to wild animals, and the common impression found is that the reason why pheasants and other wild birds are killed in the autumn is that the breeding season is over, and therefore no harm is done in slaughtering them. Moreover, the young birds have grown sufficiently to be worth killing. Both these influences have undoubtedly something to do with the result, but that is not the main point. In the autumn of the year the food is, and has been for some time, most abundant, and is of such a nature that when consumed it causes the body to become fatter and the flesh to be softer and better for eating purposes. Therefore, to kill birds at the end of the winter would not only be injurious, in that the number of breeders is reduced at a time of year when they are comparatively few, but at the same time the flesh would be distinctly worse in quality than in the autumn. By our fattening system we practically extend the period when flesh is in the best condition as food.

As already explained, the distribution of the globules of fat through the tissue of the body enhances the bulk, and at the same time softens the flesh. Hence it is that, if we examine a bird which has been properly prepared in this way, the flesh is very white and tender. The natural effect is that after a certain period the flesh hardens, and hence the difference between a chicken and an adult fowl. We can never, of course, restore the peculiar flavour met with in chicken-flesh, but we can enrich it by the use of fat and other suitable foods. The full effect of this system, however, is not seen until the bird is cooked. It is a recognised rule amongst both poulterers and cooks that an old bird and a lean bird should never be roasted, but always boiled. The reason for this recommendation is that dry heat, by withdrawing from the muscle the moisture contained therein, leaves the tissue hard and fibrous, and consequently less palatable, whilst it is distinctly inferior in digestive properties. The action of the water during boiling is to soften the flesh by soaking, and rather to increase the bulk as a consequence of the absorption of moisture into the flesh. When a bird is in fat condition, however, it is found that the action of even dry heat does not have this effect, in that the globules of fat distributed through the tissue, by melting, retain and increase the softness of that tissue. It is for this reason that cooks lard certain kinds of meat during the process of cooking, in order to retain the moisture and to prevent the escape of the natural juices. Otherwise our meat would be dry throughout, the same as it is on the outside, and we know very well that this would reduce its nutritive

* "New Book of Poultry," London, 1902, p. 121.

properties, and at the same time make it more difficult of digestion. Even with fat birds, when they are placed in dry heat, there must be an amount of evaporation, but that is not an evaporation of fat, only of a proportion of moisture in the fat, the oily property still remaining in the flesh. If the duration and extent of the heat were too great, the same effect would be arrived at, and for that reason over-cooking is just as bad as under-cooking. Still, such is not a common mistake, and we need not give it consideration. No fat is mixed with the food whilst the fowls are fed from the troughs, but when put on to the crammer a quarter of an ounce should be allowed for each bird per day, or a tablespoonful for every ten fowls, gradually increasing it to double that quantity. Fat may be bought in barrels for this purpose ready for use, but in most of the larger towns butchers' scraps can be purchased at a cheap rate, and should be clarified and stored ready for use when required. It must, of course, be melted and thoroughly mixed with the meal and milk. It is sometimes found necessary, especially during hot weather, to take steps to keep the blood cool. A little flowers of sulphur is useful to this end, but some of the fatters boil nettles, and, after chopping them up, mix with the food.

Fowls should always be fed twice a day, and at regular times. The exact hours will vary in accordance with the season of the year. In summer seven o'clock in the morning and six o'clock in the evening will be found the most suitable, but in winter eight in the morning and four in the afternoon will be better. In this case the evening meal should be rather fuller than that in the morning.

Frequently it is found that birds when first put up fret by reason of the confinement, and, instead of putting on flesh, actually lose weight. To prevent this, they should be kept without any food for the first twenty-four hours, or, if they have come a long journey, for the first twelve hours, by which time they are so eager for food as to forget about anything else. They then take a hearty meal and are content. Or a little broken maize may be spread on the top of the food in the trough in order to tempt them to eat; a little coarse grit added to the mixture will be of benefit. When trough-fed, all that remains must be taken away as soon as they are satisfied. Some of the fatters feed only once on Sundays, which is found to do no harm, though it is more a question of labour than for any other reason.

FEATHERS AND MANURE.

Where larger numbers of fowls are fatted, the feathers and manure form important items, and should be carefully collected and disposed of to the best advantage. Fatters have informed us that they were able to pay their wages by the sale of these articles. Feathers should be sorted and dried; manure must be kept dry,

and under cover, and it is demanded by market-gardeners, selling at from £2 10s. to £3 per ton. If the fattening establishment is run in connection with a fruit or ordinary farm, an outlet will be found for it in this way. More information on these products will be found in Chapter XXII.

SUMMARY.

The following rules have been drafted for us by one of the most successful South-Country fatters:

First, in fattening fowls the actual amount of food supplied goes only a little way in the production of flesh as compared with the conditions under which the birds are kept.

Second, there is a considerable difference in the readiness with which fowls fatten, even of the same variety. Large-framed birds, well grown, produce the finest specimens.

Third, where first-quality birds are to be turned out, those selected should be placed in a large outside run, and for the first three or four weeks fed on no more than one meal a day. They are then removed to the pens, and the food gradually increased in quantity until they have as much as they can eat, when they are finally finished off by cramming, as already described, the process from the time of placing in the cages occupying three weeks. The object of the treatment is to gradually build up the flesh upon the frame. This method, however, is not suitable for young chickens, which are fed right off, and is not usual for ordinary fowls.

Fourth, when cramming commences, the birds should be placed from two to six in a pen if of the same age and sex, in outdoor cages, and for the first few days be fed from a trough, and then removed to a sweet and, if possible, rather dark room or shed, finishing off by the cramming.

Note.—Observations have shown that single birds do not fatten so well as when there are, say, three together. Jealousy lest the others obtain more than a fair share of food stimulates consumption.

Fifth, before a bird is crammed, the crop should be felt, and if there remains any food in it from the previous meal, no food is given until the next time of feeding. Observations should be made as to the quantity assimilated, so as to give a fowl each time as near as possible just as much as it can digest. Should a bird show any sign of sickness, it should be placed in an open run for twenty-four hours without food. To aid digestion, grit may be given in a dish before each pen, and boiled nettles mixed with the food twice or thrice a week as an aid in keeping the blood cool. Young chickens may be fed thrice a day, but for older birds twice a day is much to be preferred.

IS CRAMMING CRUEL?

The question has frequently been raised as to whether the cramming of fowls, either by funnel or by machine,

is a cruel process, and it will be desirable to discuss the question. Our dumb animals suffer enough from their natural limitations without our imposing upon them additional pain, and we have no right to needlessly and wantonly inflict suffering upon them for our own pleasure. At the outset people have the idea, on seeing birds crammed, or reading the description of the process, that it must be cruel, and very strong statements have been made with regard to those who advocate the extension of the fattening system. We believe that the Society for the Prevention of Cruelty to Animals has been approached many times with a view to instituting a prosecution of those who practise the cramming system. But up to the present there has been no such prosecution, and, as public opinion is very strong against cruelty in any form, the power which put down cock-fighting as a recognised pursuit—although it is by no means unknown in some parts of the United States—would assuredly have stopped cramming had it been at all cruel.

When we come to examine the thing in practice, we at once discover that with ordinary care there is not the slightest cruelty at all. Of course, a careless or inexperienced operator can easily hurt a bird. It does not pay for a fatterer to be cruel, because that would involve a great amount of loss on his part. With the highly artificial state of the body, and the tendency towards heating of the blood which must always arise under such conditions, if there were the slightest injury to the throat in passing down either the funnel or the crammer-tube, inflammatory action would be set up, and the result would be that in comparatively few hours the bird would die. Such loss of birds would soon put an end to the cramming system. Thus it pays crammers to be careful. It must be remembered that the throat of all animals, and especially of birds, is very much more flexible than is commonly supposed. The tube which we call the gullet will pass down food in considerable sizes, and we have only to watch, not only poultry, but some of the higher animals, to see with what remarkable ease they can swallow substances very much larger than the tube of a cramming-machine or the spout of a funnel. The danger in cramming is not from the filling up of the throat or hurting it, but holding the head in a wrong position. The natural form of the neck vertebrae of a fowl is S-shaped, and if we were

to attempt to pass the tube down whilst the neck was in its normal position, the result would be that the end of the tube would strike against one of the cartilaginous rings of which the neck is composed, and if forced down it would literally break the neck. Breaking the neck of a fowl may be necessary after it has been crammed properly, but it will fail to bring any profit if done during the process. This expansion of the throat is undoubtedly a fact which must be remembered. The indiarubber tubes used for the cramming-machines are perfectly smooth, thoroughly flexible, have no sharp edges, and the spout of the funnel employed in France is equally well finished. Hence either of these can be passed down the throat with the greatest ease. The chief danger is in injuring the tongue, which of course differs very much from that of mammals. The head must be held in one of the hands, and the tongue placed on the under side of the tube before it is inserted fully, otherwise there will be danger of tearing it, which would have the same result in inflammatory action as already explained.

Where the cruelty of cramming would really come in is not in the actual operation described above, but in giving them too much food—in fact, filling them to repletion. There is always a danger of that, because people imagine that, if they can accomplish so much by a certain quantity of food, the giving of more will enable them to arrive at that end more rapidly, or give them better results. If the fowls are fed excessively, sickness results, and far more pain is engendered by indigestion than by passing the tube down the throat. At first the food should be limited in quantity, only increasing as the digestive powers of the bird are stimulated. It will be found that they can digest more and more as the time goes on, but no food should be given if there is any remaining in the crop from the previous meal. We have sometimes known novices, when commencing to cram, who thought that the better way was to pass the tube into the crop, and then start pumping in the food just as if they were emptying a well, with the result that the food forced into the crop burst it. That is certainly cruelty. It is unforgivable in anyone, and the system must not be blamed for the mistakes and blunders of a few operators. We might as well condemn the system of running horses in harness altogether because sometimes they are overdriven.

CHAPTER XVI.

KILLING, SHAPING AND MARKETING POULTRY.

KILLING FOWLS—FRENCH SYSTEMS OF DRESSING AND SHAPING—LA BRESSE FOWLS—THE SUSSEX SYSTEM—
MARKETING—CAPONISING—DRESSING AND TRUSSING.



KILLING fowls is by no means difficult. The best method we know is to hang the birds up by the legs, and then thrust a pointed knife into the roof of their mouth, rather in a backward direction than to the top of the skull. This is in order to reach the brain, for then death ensues very speedily, and with very little pain to the victim. The birds should be allowed to hang until the blood has ceased running, and be plucked immediately, for, it is scarcely necessary to say, it is much easier to pluck a newly-killed fowl than one which has been dead for some time, and is consequently cold. In all cases where fowls are killed to be sent to market they should be plucked by the farmer, and the value of feathers he will obtain will more than repay the labour of plucking, though this is not its object. A special knife should be employed, and Spratt's Patent sell a very suitable one for this purpose.

DISLOCATING THE NECK.

The common method of killing fowls is by dislocation of the neck, and there can be no question that in the hands of an expert operator this plan is most expeditious, and with the minimum of pain to the victim. It is not easy to follow the method from a printed description, and we should recommend all who intend adopting it to learn the actual operation from an expert poulterer, as it is undesirable to make experiments even with dumb animals. However, as a guide to those who may not have this opportunity, we give a description of the process. The bird should be held firmly by the legs in the left hand, which can grasp the ends of the wings also, the head in the right hand between two of the fingers back of the skull, so that the comb lies in the palm, the back of the bird upwards. The legs are then pressed against the left hip, and the head laid against the right thigh near the knee. Next the fowl should be rapidly and firmly extended or drawn to its full length, and at the same

time the head is suddenly bent backwards, by which means the neck is dislocated just below the junction with the head, and death immediately ensues, as all the large vessels are torn across. The operator must not be nervous, nor yet afraid, but perform the work firmly and expeditiously. Muscular contraction will take place for a few minutes, but if the operation is effective no pain is suffered. It is always better to pluck whilst the fowl is still warm, as the feathers then come out easily and the skin does not tear. There is no cruelty involved by doing so, for all sensation is at an end, the brain, which is the centre of all feeling, being completely severed from the body. In plucking, the operator should sit down, hold the legs in the left hand, the head hanging between his knees, so that the blood flows towards the head and gathers in the neck, without making any mess. It is better to draw the feathers with an upward pull, that is, the opposite way to which they lie on the body. A good man can kill and pluck twelve birds per hour.

FRENCH SYSTEMS OF SHAPING.

Next to the feeding of the fowls the most important part of the French system is the shaping, for this has much to do with the appearance of the birds when offered for sale. There are two principal methods adopted: one, used almost solely in connection with La Bresse fowls, and the other that which is nearly universal. The former method, which is adopted to give the La Bresse fowls their peculiar shape, is entirely confined to that breed. As soon as the fowls are killed they are plucked, and whilst warm are wrapped, first in a fine linen cloth, and then in a coarse one, both of which are specially shaped. These cloths are drawn very tightly, and the outer one is stitched up and then damped. The birds are kept in these cloths for twenty-four hours or more, by which time when taken out they are long in shape, with pointed ends, and are perfectly round, the legs and wings being pressed tightly into the

sides of the body. The flesh of the La Bresse is very white, and the skin thin and delicate, so that the dish, however peculiar it may appear, is very tempting indeed.

The other method, which is most generally used, utilizes a shaping-board of a different construction from anything we have seen elsewhere. The board is about 2 feet in length and 8 or 9 inches in width, this size, of course, depending upon the fowls to be placed thereon. As soon as the fowl is killed it is quickly plucked, and the head, legs, and lower bowel most carefully washed. The bird is then turned breast downwards, the hocks having already been tied with the wings through them; the rump is supported by a block of wood, and the crop by a pad, to keep the fowl level; a wet cloth is very tightly drawn over the back, and the tapes attached to it for the purpose tied down to nails or pegs on either side of the shaping-board. The whole is well drenched with cold water and left to set. Such a system brings out all the best qualities of the fowls, and secures the meat so that it can be easily carved.

THE SUSSEX SYSTEM.

Shaping is carried out in Sussex as part of the process, but in a very different manner to that described above. There can be no question that the appearance of the fowls is greatly improved thereby. This is one reason why Surrey fowls look so much superior to those not finished off in the same way. This system is, moreover, so simple that it can be adopted at very small expense, shaping-boards being very easily made. Fig. 87 shows a shaping-board built in three rows, and capable of holding 30 to 36 birds at one time. For smaller producers it can be built with one row, and the cost of material for construction of the larger size would not be more than four shillings. Each trough is made V-shaped, the front of which is rather narrower than the back. These troughs consist of only twelve pieces of wood, namely: (1) The two upright ends, 36 inches by 7 inches; (2) three troughs, each made of two pieces, at right angles, the back board 6 inches wide and the front 5 inches, and 30 inches long; (3) the bottom stay; (4) three loose boards, half an inch shorter than the troughs and 4 inches wide. It is better to use plain deals five-eighths or three-quarters of an inch thick, and fit the whole firmly together.



FIG. 87.—SHAPING BOARD.

The *modus operandi* is as follows: As soon as the birds are plucked, which should be done carefully and thoroughly, the hocks are tied loosely together, so that the legs are flat against either side of the breast. Before doing so, however, some of the more skilful fatters draw the meat upwards by means of the hands, and this undoubtedly improves the appearance of the bird, though it must be done carefully to prevent breaking of the skin. The operator strikes the stern against a wall, thus flattening and making it fit the shaping-trough more easily. Each bird is laid in the trough breast downwards, with the neck and head hanging over the front. The first bird is pressed firmly against the end of the trough, and a glazed brick or weight laid by the side to keep it in position. When the second and succeeding birds are placed in the trough the weight is moved along until quite full. It is necessary that they should

be packed firmly and tightly in this way. Next a loose board, 4 inches wide, and half an inch shorter than the trough, is laid upon the back of the fowls, just behind the wings. Upon this are placed three or four heavy glazed bricks, or two weights (56 pounds for preference), and the fowls are allowed to remain in the trough for several hours, in fact, until they are quite cold and set. When taken out they have the appearance as shown in Figs. 88 and 89. In all such matters it is desirable to study appearance, and what are the market requirements.

For the London trade it is necessary to send birds so shaped in order to secure the best prices. Of course, shaping does not add one iota to the weight, nor anything to the edible value. But it is none the less important, for the eye is the inlet to the pocket as well as to "the soul."*

Whatever the system of shaping adopted, it is necessary that the bird be plucked carefully, and it is customary in some parts to employ the services of persons called "stubbers." If any of the feathers, and especially the short quills, are left in the flesh, they will, of course, materially depreciate the appearance. We desire to urge upon every producer the duty to himself and the industry at large of turning out the fowls in the very best manner possible. Some fatters are very fond of breaking the breastbone of fowls, and this is frequently done in Sussex. It is a most objec-

* Fig. 91 shows the appearance of birds in shaping-board.

tionable practice, and one that ought never to be adopted. As a rule, all Surrey and Sussex fowls are singed immediately they are plucked and stubbed, and when properly done there is no objection to this custom, as it is simply clearing the skin of surplus hair and feathers. But the flesh must not be blackened. Straw only should be used.

MARKETING.

In all industries the ideal would be that producers and consumers should come into direct contact with each other, and in former days this was the case to a greater extent than now. But with the growth of great centres of population, and rapid intercommunication between all parts of the country, this can only be to a limited extent. Whenever possible, and this ought to be so to a greater degree than is generally supposed, direct sales should be made, to which end markets should be encouraged. But however much we may

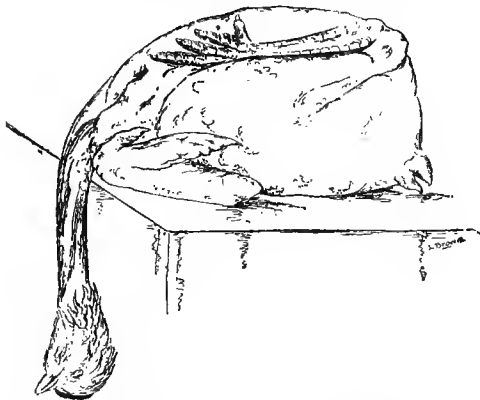


FIG. 88.—SHAPED SUSSEX FOWL (BREAST UPWARDS).

declaim against the middleman, he is a necessary factor, and so long as he is kept in his right position, that is, an intermediary between one class and another, and not a dominator, he serves a most useful purpose, earning well the commission allowed him, and saving more than his cost. But if the result is at once to depreciate the return obtained by producers and enhance the cost to consumers, then we have a very serious state of things. In practice we know that better prices can be obtained for the great bulk of table-poultry from salesmen and dealers than in any other way, more especially by those who have good birds to sell. Complaints are chiefly rife amongst those who send forward mediocre or poor qualities of any produce. We are bound to recognise, therefore, that it is to "the trade" we must look for help in this direction, and the greatest success will be achieved by producing for it, unless where there is a good local demand retail.

The time of year when poultry is marketed is an essential consideration. Again and again when com-

plaints have been made as to the small prices received for chickens, it has been found that no thought had been given to the ruling rates at different seasons of the year. Chickens are worth, as a rule, about twice as much in April as in August, and in this connection it is necessary to bear in mind that when the game comes in the demand is greatly reduced and the prices correspondingly lower. Messrs. Brooke Brothers, of the Central Markets, London, have kindly furnished us with the average values of Sussex poultry sold by them during one complete year, as follows:

			s.	d.	s.	d.
January...	...	...	...	3	6	
February	...	...	...	3	6	
March	...	...	...	3	9	
April	...	...	...	4	6 to 5	0
May	...	...	...	4	3 to 4	9
June	...	...	...	3	9	
July	...	...	...	2	9	
August	...	...	...	2	6	
September	...	...	...	2	9	
October	...	...	...	2	6	
November	...	...	...	2	9	
December	...	...	...	3	0	

These figures show that the average for the first six months was 4s. 1d. per head; for the second six

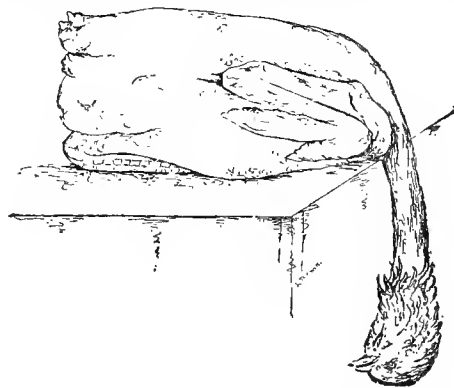


FIG. 89.—SHAPED SUSSEX FOWL (BREAST DOWNWARDS).

months 2s. 8d. per head; and for the entire year just over 3s. 4d. per head. But they include all qualities, and many of the best fatters would secure much higher return. The point to be kept in view is that the best prices are obtained during the earlier months of the year, and the great bulk should be marketed by the end of June.

PACKING.

Much carelessness is shown in the packing of dead poultry, and this needs care. We have seen crates of chickens opened, and their value materially reduced by reason of bad packing, many of the birds

being "barked," or otherwise damaged. They ought to be packed firmly and evenly, and if this is done they will carry long distances in perfect safety. In this country specially-made crates, or "peds," as they are called, are employed, which combine lightness with strength. These (Fig. 90) are lined out with straw, and there are layers of the same material between each row. The birds are placed with the sterns to the sides, and in double rows. In France linen cloths, which are first dipped in milk, are often employed, and for the better class of fowls they are to be recommended. It may be mentioned that some of the railway companies are willing to supply hampers free of charge for conveyance of the dead birds.

In order to obtain the best results, chickens should always be killed where they are fatted, otherwise much of the benefit obtained by the system will be lost. A fatted fowl will lose a considerable portion of its added weight if sent to market alive, due to the change of condition. The same thing is found in connection with larger stock. In these days of refrigerating chambers there is no difficulty in keeping dead poultry for several days, in order to avoid glutting the market.

SUMMARY.

To obtain the best results in connection with the fattening of chickens the following points are to be kept in mind:

1. We must have the right kind of fowl. As before mentioned, nearly all fowls can be improved by fattening, but there are those which specially lend themselves to the process, and take more kindly to it. The prejudice in favour of white legs has to be reckoned with, although it is not wholly justified. Several of the finest French table-breeds have dark legs, and they are equal to anything we have in flesh qualities. But yellow-legged varieties always take a second or third place.

2. To obtain the best prices we must have early hatching and late. We must study the market returns, and endeavour to place the produce when rates are highest. As a rule, there is an abundant supply when the demand is small, and we must try to remedy this state of things.

3. There must be a system of fattening and killing by the fatter. Sufficient has been said to show the importance of this system, which is carried out in connection with larger stock, and should be universally

adopted for poultry. As a rule, it will be found that having separate fattening establishments will give the most satisfactory results.

4. The fowls should be properly shaped, neatly plucked, and carefully packed.

CAPONISING.

Before leaving this subject it is important to deal with the question of caponising. There can be no question that the system of caponising is one that deserves considerably more attention than it has ever received in this country. If for no other cause, it would have been reasonably expected that pecuniary motives would have led farmers and large poultry-

keepers to adopt the system, for cockerels caponised, and pullets made into poulardes, grow to a very much larger size than those not so treated, and it is true that the quality of meat is much improved; not only so, but male birds which could not be kept together without great danger of constant conflicts will live in peace and amity. This latter reason would of itself be sufficient to warrant the adoption of caponising to a

considerable extent, for the pain suffered by a bird is so infinitesimal, as compared with the result of a single fight, that the benefit altogether outweighs any objections on this score. But when there is the additional inducement of getting very much larger size in the fowls, with very little outlay—for the birds thrive better and lay on flesh more rapidly, not being so restless in temperament—it is most surprising that the plan has not been very largely adopted. In France capons are very numerous indeed.

Therefore, upon the ground of profit, it is strongly recommended that all male fowls intended for table in the autumn should be caponised, because the surplus cockerels can thus be made the most of, and will realize for the breeder more than they otherwise would. When this position is accepted, there next comes the question of how it should be done, for probably the objection to what would appear to be a surgical operation is what weighs with many who have never adopted the system. They have a very right and proper objection to the giving of pain. So have we. And if it were not that we know the pain is momentary when the operation is rightly performed, we should be the last to countenance, much less advocate such a system. Granting,

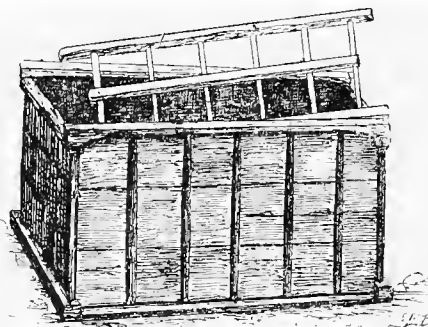


FIG. 90.—SUSSEX PACKING-PED.

therefore, what we have been saying has been accepted by the reader, the next point is—How can the act of caponising be performed? In reply to which question we give the method which has been perhaps the most successful, namely, that introduced by Farmer Miles, an American, who was over in this country a few years ago, and who then explained his system. The instruments used are special ones, and can be bought from makers of surgical instruments. Spratts Patent advertise a set, which we have found all that is necessary.

HOW TO CAPONISE.

The best birds to operate upon are chickens which have never yet crowed; and when about three or four months old is the right age. They must be kept without food for thirty-six hours or more before being operated upon. A good light (sunshine if possible) should be chosen to operate in, and the full light should be allowed to shine in the chicken's side when opened. First take two good thick pieces of string, or thin cord, 3 feet long; to one end of each attach a weight, or any equivalent in the form of a brick or stone, fastening the other end of the string to the chicken's legs. Then lay the bird on its left side, and drop the weighted end of the string over one side of the operating-table. Now tie the free end of the second string round the bird's wings near the body, and drop the weighted end of this string over the other side of the table. The chicken will thus be properly secured, and the operator must stand so that its back will be towards him. The small feathers from hip-bone to ribs, over the last rib, must now be plucked off, and the ribs and feathers all round should be wetted with a sponge dipped in quite cold water, or ice can be used if preferred, as this wetting will serve to keep the feathers out of the operator's way, and will also numb the sensations of the fowl, so that it does not appear to feel the operator's knife. Stick the knife in half an inch deep between the first and second ribs from the hip-bone, and cut downwards and forwards to the end of the ribs. Turn the knife, and cut nearly up to the back-bone. Now put in the spreader, which is one of the instruments used, tempering the tension by a rubber band provided for the purpose, to suit the size of the fowl, and with the spreader open the ribs, after which split the inside striffin that covers the bowels. The upper testicle will now be exposed, and should be grasped by the grippers, which should be given one entire turn over so as to separate the testicle from its attachments, except the spermatie cord, and pull the testicle out. Treat the lower testicle in the same way. It is necessary to be careful not to rupture the large vein under the testicles, and also to get the whole of the latter out. The bird may be untied and allowed to go without the incision being sewn up, but for a few days it should not be allowed to fly up to roost. Birds may in this

manner be caponised in any number, and without loss of more than one or two per cent. Large breeds of poultry when caponised young and well fed until ten or eleven months old, and then fattened, will weigh 12 to 15 pounds each, and the meat on them will be found of the tenderest and most succulent description.

It is to be noted that the chief dangers found in practice with all systems of caponising is in tearing the veins near the testicles, which results in the bird's bleeding to death, and in the losing of the testicles amongst the intestines, which latter is almost certain to cause inflammation and death. These seldom happen, except through want of care or inexperience, but it is important to have a good light in order to prevent it as far as possible. The want of care can be avoided, and to overcome want of experience it is better for a novice to make his first experiments on a dead chicken, so as to learn exactly the position of the place to be cut, and of the testicles. A little study of anatomy in this way is highly useful, and, in fact, it would be cruelty for any novice to commence operations on a living bird. The first time must necessarily partake of the nature of an experiment, and therefore there should not be any risk of giving unnecessary pain. For all operations firmness and confidence are necessary, without which a bungle is sure to be made, and these are not to be had except there is actual knowledge of the subject and of what has to be done. This actual knowledge can only be obtained by experience.

DRESSING AND TRUSSING.

Fowls which are being marketed in the usual manner must never be drawn or cut in any way, as the final work is performed by the poulterer in accordance with his customer's requirements. When chickens are sold direct to consumers, it is better if they can be delivered ready for cooking. Cooks are not nearly so expert at this business as they were formerly, and, further, they naturally prefer to have a bird which does not entail the labour necessary if it is sent undrawn. In some parts of the United Kingdom the method adopted by poulterers is by no means the best, and the following explains, as far as possible in print, the system which gives the most satisfactory results. For this purpose a special knife is required, as the *Encore Poultry Knife*, made on the author's suggestion by Messrs. Thomas Turner and Co., of Sheffield, a trussing needle (12 inch preferred, as then it can be used for turkeys, which are trussed in the same manner), and some fine, strong string:

For Roasting.—Presuming that the chicken has been properly plucked, lay on its back with feet away from the operator, (1) nick the skin of each leg just above the joint so as to cut the sinews; (2) trim the pinions, cutting off the skin on outer side, so as to remove all marks of feather pits; (3) lay chicken on its chest,

with stern towards operator and head away from the body ; (4) make a transverse cut in skin of neck about 2 inches from back, and lay skin thus loosened backwards, exposing vertebrae ; (5) cut off neck and head where neck joins the back, and leave about 2 inches of neck skin—this can be done by the knife named above without cutting under skin ; (6) now turn bird round sideways, breast upwards, and laying back the neck skin to expose the front of breast ; (7) press the thumb firmly down the A-shaped orifice thus exposed, cut out crop, and insert finger into body, loosening internal organs all round from breast-bone and carcase ; (8) carefully cut out merry-thought ; (9) turn bird round in the hand, make a transverse cut across the vent immediately below the 'parson's nose,' and an angular cut at each side, which prevents the sides cracking when the bird is being drawn ; (10) insert forefinger and find 'trail,' which cut off, loosen the fat over gizzard gently but firmly, and draw all the intestines through vent, taking care not to break any organ ; (11) now place chicken on the table, breast upwards, and insert long needle between thigh behind leg-joint, pressing to corresponding place on other side, using fine string, and drawing through ; (12) lay fowl over on table, and insert needle in first joint and hand of wing, draw through and pass string over back, repeating on reverse side, here pull

tight and tie up ; (13) insert needle through body at end of back-bone, carry over leg and under the breast, but it is unnecessary to pierce the meat on breast ; (14) carry string round other leg and tie, the legs standing away from behind the body ; (15) chop off the toes ; and (16) when the fowl is smoothed over by the hands it is complete.

For Boiling.—With the exception that it is unnecessary to cut the legs, (1) proceed exactly as described for roasting to 10 ; (11) insert first and second fingers of one hand through vent, and loosen the skin on thigh down to hock on both legs. This is an easy operation, only needing a little care to prevent tearing the skin ; (12) make a cut through skin on inside of each leg about an inch above hock knuckle ; (13) take chicken in hand, turn lower leg, or shank, under thigh, feel with finger inserted under skin for cut, and draw leg under skin, repeating this process on other side. The feet only will now protrude, and they should be cut off ; (14) insert needle through front of body and stitch wings as in roast (11 and 12) chicken, but the wings may be shortened and inserted under skin, as are the legs ; (15) pass needle through thighs behind, and tie up on back in front of stern.

The process of boning can only be learnt practically. and we therefore do not attempt to describe it.

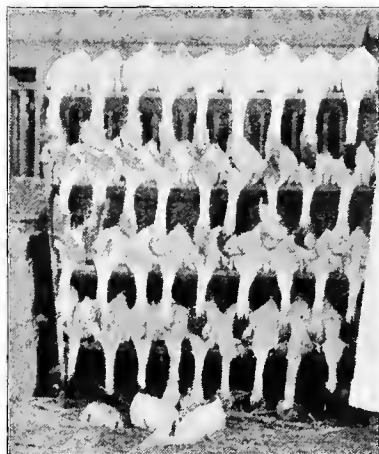


FIG. 91.—FOWLS IN SHAPING-BOARD

CHAPTER XVII.

DUCK-FARMING.

THE DUCKLING TRADE—DEMAND FOR DUCKS—THE DUCK DISTRICTS—BREEDS OF DUCKS—SELECTION AND BREEDING
—METHODS OF DUCK-FARMING—VALE OF AYLESBURY—HOUSES AND SHEDS—FEEDING—HATCHING—REARING—
FATTENING—KILLING—COST—DUCK-REARING IN THE STATES.



ONE of the most profitable branches of poultry-keeping, more especially for those whose opportunities are limited, is in the raising of ducks for market, although, as we shall afterwards show, this industry is now carried out upon a much larger scale than was formerly the case. In the spring months of the year there is a great demand for ducklings at high prices, more especially in London and the greater centres of population. During the summer large quantities of ducklings are sold, but at that period of the year they are in demand more in the provinces than the Metropolis, and especially near holiday resorts. The prices, however, are much lower than in the spring, and the returns commensurately smaller. In the autumn and winter mature ducks are sold to a considerable extent, although the inquiry for them is not increasing. This is surprising, from the fact that, in our judgment, a well grown and fed autumn duck is finer in flavour and more abundant in flesh than a duckling. At the same time we must recognise that the latter, during the earlier months of the year, is worth two or three times as much per pound as the latter in the autumn. A duckling is one of those fashionable dishes the supply of which yields considerable returns to producers. It may here be well to explain the difference between a duckling and a duck. When the former are from nine to twelve weeks old, in accordance with the breed and the method of production, they cast off their duckling feathers and assume adult plumage, and it must be conceded that the flesh varies very considerably, losing that tenderness which characterizes a good duckling.

Until a few years ago the industry was almost entirely confined to Buckinghamshire, the Vale of Aylesbury forming the centre. Afterwards it extended into Bedfordshire and Oxfordshire, but within the last ten years it has been met with in different parts of the country. In Norfolk, Suffolk, Lancashire, Lincoln-

shire, and in Cambridgeshire, duck-raising on advanced lines is met with, and the pre-eminence which once marked Buckinghamshire and Bedfordshire is no longer theirs, although it must be conceded that the highest-priced ducklings are frequently sent from the two counties named. At one period it was contended that there were some special virtues in the district, more especially in the gravel found, which explained the quality of the ducklings. That, however, is without justification. The real explanation why the duck industry has, to a considerable extent, passed elsewhere is because the duckers of Bucks and Beds believed that they need not fear any competition; and finding the industry a profitable one, they refused to advance with the times. It was not for many years after incubators had been successfully operated for duck-hatching in other parts of the country, that the duckers would even consider the desirability of adding to their productive power in this manner. Many of the younger men are recognising the necessity for progressive methods, but it is too late to regain the ground lost. Even now we must look to other parts of the country for the best examples in duck-farming. In America very great developments have been made, and, as we shall show in a later paragraph, the equipment of duck-farms in the United States is greatly in advance of what we have yet to show in this country, although it promises not to be so for very long.

BREEDS OF DUCKS.

In respect to the various races of ducks the choice is not a large one, and the following brief descriptions comprise the varieties which are chiefly employed.

AYLESBURY.—The name is derived from the fact that this duck has been so largely bred in the Vale of Aylesbury; matures with wonderful rapidity, for ducklings are killed weighing 5 pounds at eight weeks old and under; pure white in plumage, an excellent layer, and very hardy, with great richness of flesh; heavy in body

and short in leg, the appearance being that of a boat supported midway or a little behind the centre; the bill is long, and in the best specimens of a delicate flesh colour; the legs are of a deep orange. Drakes will reach 10 pounds and ducks $8\frac{1}{2}$ pounds when fully matured.

ROUENS.—In plumage Rouens are almost identical with the Mallard, or wild duck, and the drake shows all that richness of colouring found in its wild progenitor during winter; grows to the largest size of any duck found in domestication, but for that reason it cannot be matured with equal rapidity to the Aylesbury; more suitable for fattening for winter consumption. Specimens have been seen weighing 22 pounds 4 ounces the couple. An excellent layer, has very fine flesh, and is extremely hardy.

PEKINS.—Of Chinese origin, and have rendered service in giving a needed stamina to the varieties we had when first introduced; white with a canary tinge in plumage, has a deep orange bill and legs, and is readily distinguished from the English duck in that its legs are placed well back, giving it a somewhat penguin appearance; matures fairly well, but never attains the size of the varieties already named, though in appearance it may appear to do so, as it is very profusely feathered.

INDIAN RUNNERS.—A smallish-sized duck; as an egg-producer it is specially valuable, and the eggs are not quite so large as those produced by other varieties; parti-coloured in plumage, the neck and sides white, the rest of the body coloured, fawn being usually preferred. By reason of small size they are not usually bred for table purposes, though excellent in flesh qualities; excellent foragers, very active in habit, are small eaters for ducks, and very seldom become broody.

There are many other varieties of ducks, but we need not describe them. Only one has economic qualities which should give it a place amongst profitable ducks—namely, the Muscovy or Musk duck. This is a large, well-fleshed bird, but it is characterized by so evil a temper that its chance of popularity has been destroyed in that way, and it cannot be recommended for practical purposes. Each of the other breeds named have individual qualities which make them very valuable. These qualities may be described as follows: If for early maturity, Aylesbury; for great size and later development, Rouens; for egg-production, Pekins and Indian Runners.

CROSSES.—A cross which can be recommended—Aylesbury and Pekin—is excellent for early maturity, and very hardy. Another good one is between the Aylesbury and Indian Runner. The latter cross, however, does not give birds quite so large as the first-named.

SELECTION AND BREEDING.

The first point to be regarded is selection of the stock birds, which is of great importance, not only

with regard to breed—though that is a most necessary consideration—but also as to age and time of hatching. For early ducklings there is nothing better than the Aylesbury as a pure breed, for it is a rapid grower and fattener; but a cross between the Aylesbury and Pekin, using a Pekin drake to Aylesbury ducks, is often found hardier. It is important to obtain the ducks good and from an undoubted source, so that they may be pure. They should be large, well-grown, and early hatched. For securing spring ducklings it is necessary to use ducks of the year, or the eggs will not be laid early enough; therefore ducks hatched in February or March should be chosen. To these should be mated drakes of the previous year, and the doing so will to some degree counteract the breeding from immature stock on the one side. Too early breeding is a great mistake when the production of stock or even laying birds is concerned; but when the produce are to be killed for table no great harm results, and that is the only way to obtain what is required. Whether ducks are selected from amongst the present stock or purchased, it is essential that they be well-grown, large-framed, and healthy. Any not coming up to these requirements should be rejected. The birds so chosen need not be mated until the end of October or the beginning of November, and in this way, if the supply of eggs comes as expected, one or two broods may be hatched before Christmas, by which time a large number of eggs should be undergoing the process of incubation. Hatching may be either under hens or by means of an incubator, but as to this we speak anon.

EARLY BREEDING.

One of the most important points in connection with duck-keeping is securing the best prices by having ducklings placed on the market early in the season. In order to do this they must be bred early; but with many duck-keepers the difficulty is to obtain eggs in late autumn and early winter. If ducks or other fowls are allowed to breed when they like, if the stock ducks are themselves late hatched, if they are fed carelessly, the probabilities are that eggs will not begin to appear before March, when it is altogether too late to hatch ducklings if we are to obtain good prices for the birds; therefore those who desire to be successful in the production of ducklings for spring marketing should proceed to work in the autumn. That the business is a profitable one cannot be doubted. It is estimated that about £70,000 is annually paid to the duckers of the Aylesbury and Leighton Buzzard districts for ducklings; and as ducks can be reared at small cost, are very hardy, and will thrive almost anywhere if they have a reasonable share of attention, and as good prices can be obtained in the great towns of Britain, there is a large margin of profit to the producer. The following

are prices given us by Messrs. Brooke Brothers, obtained by them in Smithfield Market: January, 6s. to 10s. per couple; February, 6s. 6d. to 11s.; March, 9s. to 18s.; April, 7s. to 12s.; May, 6s. to 8s.; June, 5s. to 7s.

METHODS OF DUCK-FARMING.

It has been already intimated that large numbers of ducklings can be reared on a small area, as the whole period from the time of egg-production to killing should be comprised within three months. Moreover, these birds can be raised very thickly, and thus there is rapid overturn. It is no uncommon thing for 1,000 to 1,500 ducklings to be reared on a single acre of land, and within a period of six to seven months. The chief danger under conditions like these is that the land should become so charged with manure that there is not time for exhaustion of the ammonia before another season comes round. We believe that, to some extent, at any rate, the fact stated explains why duckers in the Aylesbury district have not succeeded to the same extent as was the case formerly; and for reasons which will be afterwards explained, the land occupied during one season by ducklings should not be so used again for a couple or three years. In the meantime it should be heavily cropped. We have no desire to discourage small poultry-keepers—indeed the reverse—but it must be pointed out that there are limitations imposed by Nature which we must not attempt to break through. Consequently duck-raisers should not occupy the whole of their land in any one year, but be able to move on to fresh ground from time to time. For this reason small holders and farmers should succeed better than cottagers.

It will be realized that under such intensive conditions as we have already mentioned, the keeping of stock birds would do much to restrict the space available for rearing, which explains why, as a rule, in this country duck-raisers do not keep breeding stock. In the United States that plan is not followed, for upon the great farms met with in that country breeding stock are kept and the ducklings raised. We are inclined to think that the plan here recommended—namely, of securing eggs from breeders—is to be preferred in this country, as there is less danger under these circumstances of enfeeblement of the stock or of overcrowding the ducklings, with the tainting of soil which must result. It is to be remembered that stock birds must have liberty and water. When we say they must have liberty, this applies more to the question of water than of land. We have for several years kept flocks of breeding ducks within enclosed yards, each about one-eighth of an acre in extent, with the greatest success, but through these yards was a running stream, and the birds disported themselves in the water nearly the whole day long. The system of buying eggs is almost universal throughout the

ducking districts, and that plan has been followed also by Mr. Walsh, of Fleetwood, to whom references are made more fully later on. Mr. Walsh has entirely changed the character of poultry-keeping in the Fylde district of Lancashire, because of his demand for ducks' eggs to fill his incubators, and in many parts of that county 100 ducks are now kept where there was only one before. The breeders secure good prices for their eggs, and thus the business is profitable to them. Unless stock have sufficient exercise, it is impossible to expect that they will produce eggs with strong embryos, and that is a most important point.

THE VALE OF AYLESBURY.

In Britain the Vale of Aylesbury is the great centre of duck-breeding. The great majority of ducks reared at Aylesbury come from the hands of the better-class labourers, some of whom have raised themselves into a very comfortable position by their diligence and thrift. Operations are usually commenced in December, but sometimes in October and November, when the eggs for producing the earliest batches are "set." As a rule the breeders do not keep the adult birds themselves, but on all the farms in the district flocks of ducks are kept, and contracts are made with their owners for a constant supply of eggs during the coming season. These are at a uniform price, but there is great variation if bought without such contracts. In May 2s. per dozen would be a fair price for ducks' eggs, but in December 12s. per dozen is frequently paid. That is a matter of supply and demand, though the value of a duck's egg in December is also measured by the fact that the possible duckling within it may be worth 6s. or 8s. in May, whereas one hatched in April would not realize more than a third or a quarter that sum. The eggs are taken by breeders and set under hens, for ducks are very seldom employed for the purpose.

The hatching hens are accommodated in outhouses and sheds, and often 150 hens may be seen at work on maternal duties at one time. Every day they are fed and the nests examined, but this is simple compared with the labour involved at the end of four weeks, when the young ducks begin to appear. Ducklings have one special characteristic, in that they need little brooding, so that the progeny of half a dozen sitters can be placed under charge of one hen, and proud she will be of her large brood. From the very first the feeding has in view the development of flesh, and not bone. Consequently only those meals which are strongest in flesh and fat-formers are used. For the first few days hard-boiled eggs, rice, and bread are given, after which barley-meal, mixed with scrap or tallow-cake, grains, and toppings, form the staple diet. On such feeding as this the growth is simply marvellous—they can be seen to grow. Kept in batches of about fifty, they are fed with the greatest regularity; and

it must not be forgotten that in every pen is placed a trough of the famous grit found only in the Vale of Aylesbury, and for which almost miraculous powers are claimed. To it is attributed almost all the merits of the Aylesbury duck—the quality of its flesh, the rapidity of growth, and the delicate pink of the bill, which is one of its distinctive marks. The birds appreciate this grit, and duckers use large quantities of it. Some of the ducklings sent to market have never known what it is to be in water, but as a rule they are now and again permitted a bathe or a swim. The pens in which they are kept are none too large,

go rapidly back. Killing and plucking are carried on at great pressure, for it is no uncommon thing for a ton of ducklings to be despatched from this district in a single day. This would represent about 7,000 birds per month, and the annual amount paid to the district is estimated to be nearly £40,000. Some time ago upwards of 8,000 ducklings were seen in one Buckinghamshire village, and whilst there are no statistics obtainable as to the annual product, those best qualified to judge say that the trade is steadily increasing. The duck which is almost alone reared in this district is known all over the world.

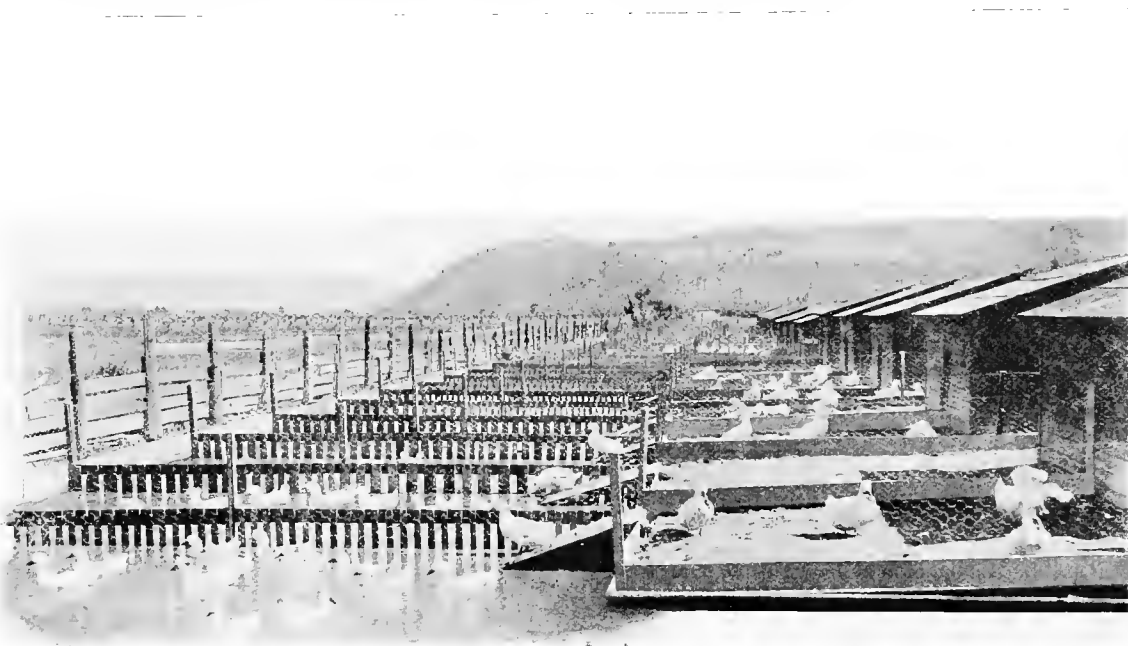


FIG. 92.—BREEDING PENS AND SWIMMING POOLS FOR DUCKS (CYPHERS DUCK PLANT).

but there is reason in this, and fresh straw is supplied every day, their greatest enemy being cramp, to which they are very subject if exposed to draughts or the place be too damp.

The skill of the feeder is exemplified by the rapidity with which he can have the ducklings ready for market. They are enormous eaters, and every day of life means a serious addition to the cost. Further, the earlier they are ready, the more certainty of securing the best market, and the vacating of space for other batches. The majority of the ducklings sent from Aylesbury are seven or eight weeks old, but it is possible to have them ready at six weeks. They must be killed as soon as they are ready, and not kept a day longer than the hour when they are ripe, or they will

HOUSES AND SHEDS.

The arrangements made for the housing of the ducks must necessarily depend upon the opportunities of the breeder. Where space is limited, and there is small fear of injury being wrought by the birds, they may be given full liberty and allowed to wander where they like. Under these circumstances the houses can be scattered about in the most convenient places. A duck-house does not need to be as lofty as one for chickens, because ducks sleep upon the ground. For a breeding-pen of thirteen birds—that is, ten ducks and three drakes, which may be all kept together—a house 6 feet by 4 feet 6 inches allows plenty of space. This house may be either gabled or a lean-to, and it should be thoroughly well ventilated; in fact, the upper part

of the front is often better if it is made with a shutter and wire netting behind, so that during the greater part of the year this can be left open. Where the birds must be kept within a measure of confinement, then a house should be placed in the neighbourhood of running water or a pond, and yards enclosing both water and land can be arranged. Fig. 92 shows an American duck-yard for breeding-stock, modelled upon excellent lines. The most important point with regard to duck-raising is that other classes of poultry should not be kept with them, and this section should be entirely distinct.

A mistake is frequently made in placing the houses too near the water, and a great amount of cramp in the breeding-stock results. The house should be upon thoroughly dry soil—dry, that is, even during the winter or wet season—because we must bear in mind that although ground may be some distance from the water, yet percolation means that, unless the place where the house is located is considerably above the level of the stream, it will be damp. Around the house should be an enclosed yard, which may be made of 2-feet wire netting or of low hurdles. The object of this is that ducks, if they have the opportunity, will lay anywhere rather than in their house, and frequently on the water. That can be prevented by keeping them within the enclosed yard until 10 or 11 a.m., by which time nearly every bird that is going to lay that day will have produced her egg. Under the conditions named, duck-breeding is of the simplest character, because the birds have plenty of water to drink, and they can be fed the same as ordinary poultry. There is only one point to bear in mind—that is, ducks desire a drink of water after each mouthful of their food, and it should be available to them in one way or another. Those birds which have access to either a pond or a running stream do not require much in the way of green stuff, because they can find what they want in that direction. When in confinement it is desirable that the ducks shall have everything in this way that is available; cabbages, turnips, and tubers, the latter especially, are all excellent for that purpose.

FEEDING.

The treatment of ducks when mated is of great importance, for all preparations will be useless unless there is a supply of eggs. Food given must be good and plentiful, but certainly not of a fattening nature, or the ovaries will become so clogged with fat that the birds will be unable to produce eggs; hence Indian corn should not on any account be used, except in very small quantities, because of its fattening quality. The staple food should be barley-meal, mixed with about half its bulk of thirds or pollard if the barley-meal be good and floury; but if it be of commoner quality, then so much of the thirds need not be used. Butchers' offal, liver, and scraps are all good, if well boiled,

chopped fine, and mixed with the meal. But where these are not available, or in too limited quantities, there is nothing better than tallow greaves, or scrap-cake, as it is called in some places, for it is rich in the elements required. It should be broken up and boiled or simmered for a couple of hours until it is quite soft, when it and the liquor in which it has been boiled should be mixed with the meal. Another excellent plan is to make a contract with hotels for taking all their waste scraps, which can generally be done on satisfactory terms. Whatever is used in this way is better boiled, and then mixed with the meal; but it is important to warn against use of diseased meat, which ought never to be employed. Some duck-raisers give boiled horse-flesh to their birds, and if sound nothing can be better; but so many horses obtained in this way are diseased that it is necessary to utter a warning against their use. Of course, meat given must not be too fatty; but, if fed judiciously, meat will give that necessary stimulus to the egg-organs that is needed in winter, and yields elements required for a constant supply of eggs. The meal should be well and thoroughly mixed, adding as much boiling water as is required to make it into a crumbly mass, for on no consideration must it be given sloppy. It is better to feed from troughs, as this prevents waste of food, and what is left can be removed when the birds are satisfied. Stock ducks ought to be fed twice a day: first, as early as possible in the morning, and, second, about an hour before they retire for the evening; the former should always be as soon after daylight as can be. It is an excellent plan to throw a handful or two of oats into the water in which the birds swim or bathe during the day.

HATCHING.

In the great duck-rearing districts of England and France hens are almost exclusively used for the hatching of ducks, and very few indeed are entrusted to the ducks themselves, except late in the season. Ducks are not very ardent sitters, and only seldom show the desire to incubate. Incubators are coming into use for duck-hatching. That ducks' eggs will hatch in an incubator equally as well as hens' eggs there can be no question, it being only necessary to give them sufficient moisture, and to sprinkle them daily, to prevent the shell and outer membrane becoming dry and tough. One gentleman who has experimented in this direction writes us: "I am rather puzzled why the people in the Aylesbury district do not use incubators, because it seems to me that the incubator is eminently suitable for ducks, on account of their (the ducklings) not requiring brooding. I have raised ducks that were simply hatched out by the incubator and put in an old rabbit-hutch, with a piece of carpet over a spar floor, no hen being used at all or any kind of foster-mother employed. Out of six ducks treated in this way experimentally, I raised the whole to a

suitable size, but one of them has died. The other five are now large birds, and the only difficulty seemed to be in connection with the introduction of them to the general flock. We tried to put them among the other birds the other day, and they resented the intrusion of apparent strangers." This letter bears out the opinion already expressed as to incubators for ducks; but we should recommend that, as far as possible, hens' and ducks' eggs should not be placed in an incubator at the same time. They can be hatched together, for it has often been done; but as the latter need so much more moisture than the former, there will be too much for ordinary eggs. The reason why incubators have not been employed in the Aylesbury district is simply indisposition on the part of duckers to adopt new methods. They have been used to hatch under hens, they make a very good profit out of the business, and consequently they are indisposed to change or try anything new. The use of incubators would minimize their labour greatly in the winter season, when broody hens have to be sought for. But at all times of the year there is a fair supply of these natural incubators, for the poultry kept in the district is of the Asiatic and Dorking type, in the former of which especially the maternal instinct is very largely developed. But high prices have to be paid for broody hens in winter, and the cost of an incubator would speedily be repaid. As to the difficulty mentioned in the last sentence of the above correspondent's letter, that would not apply in the usual way, as ducklings would be added to the general stock at an early age. The same trouble is found if ducks are hatched under hens and kept by themselves until fully grown. It should be mentioned that when ducks' eggs are hatched under hens they must be plentifully supplied with moisture. The ground below the nest should be kept damp, but in addition it is an excellent plan to moisten the eggs daily with water heated to about 102°. During the earlier stages they must not be allowed to lie in the water, simply dipped in, but about the fifteenth day they may be left in the water for a minute or two. In this way moisture required by the egg is secured, and that drying and toughening of the shell which would effectually prevent the egress of the duckling is avoided. This is a most important matter, both with eggs under hens and in the incubator. When the ducks are allowed to hatch their own eggs, they will usually have a swim at least once a day, and then they come back with feathers all wet, in addition to which they select a damp place for laying. We must, therefore, follow their example. With the exception named, the arrangements for hatching ducklings are the same as for hens' eggs, it being remembered that they take twenty-eight days. In winter it is desirable to place the nests in a warm position, so as to be affected by the external atmosphere as little as possible.

The largest establishment for duck-raising in this

country is that already referred to, owned by Mr. Peter Walsh, of Fleetwood, in Lancashire. Mr. Walsh has proved abundantly that the hatching of ducklings can be carried out as successfully by means of incubators as under hens. At the time of our last visit to his place he had sixty-five incubators at work, each holding 100 eggs, located in five rooms. At one time he employed broody hens in addition, but he found that the most satisfactory results are obtained by depending upon incubators alone. It is unnecessary to go into any details as to this question, because the observations made in connection with incubator work generally apply. We believe, however, that the best results will be obtained from machines which are thoroughly ventilated, as the consumption of oxygen by the growing embryos appears to be greater in the case of ducks than in that of chickens. Hence we are inclined to think that the best results are obtained where the egg-chambers are large in relation to the number of eggs accommodated. In fact, it is frequently found that a higher percentage of hatching will be attained if the egg-drawers are not quite full. At certain seasons of the year there is great temptation to crowd the egg-drawers, but that appears to be a mistake. An excellent plan is, in addition to the usual arrangements for moisture, to have a sponge or piece of flannel, and when the eggs are being cooled to dip it into warm water and dab the upper sides of the eggs before they are returned to the machine.

REARING.

The remarks which we have previously made as to the inadvisability of removing chickens too early from the incubator will apply equally in the case of ducklings, and they take no harm if they are allowed to remain in the drying-box for from thirty to thirty-six hours. In a large establishment, more especially for the English type of incubator, a very excellent plan would be to have an empty machine, heated, of course, to exactly the same temperature, and place the young birds in it as soon as they are hatched. That would, more especially with a prolonged hatching, prevent the eggs not yet completed from being interfered with. Also, it would give the ducklings more warmth than is usually found in a drying-box. When the period is over, the birds should then be removed, either to a roomy brooder, or, to what is much better, a large brooder-house, where they can be kept for the next eight or nine days. Such a house may be heated with pipes, and if there is plenty of room in the building, the ducklings, divided into lots of about 100, can be kept there almost entirely during the period named. If brooders are preferred, then care should be taken not to overcrowd them, but we are inclined to think that the best results will be obtained in the pipe-heated houses or those in which brooders are placed, because under these circumstances the ducklings, if they like,

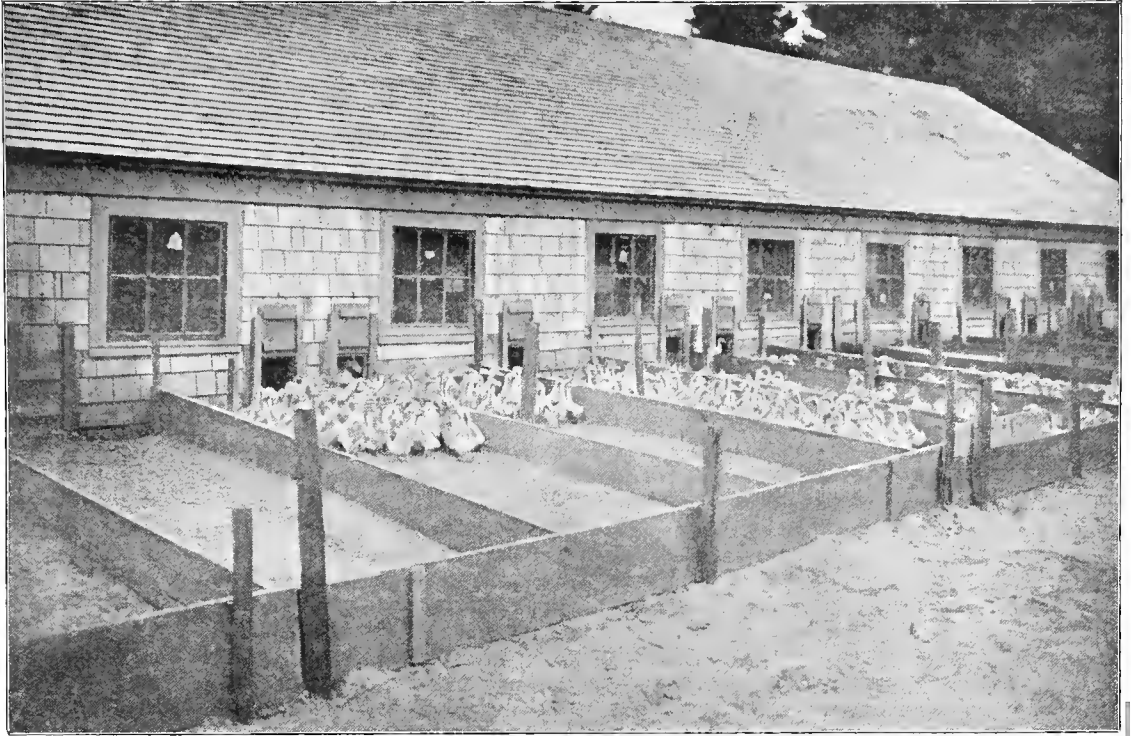


FIG. 93.—WEBER DUCKLING-HOUSE.



FIG. 94.—BROODING-HOUSE, RANKIN'S DUCK FARM.

can come and sleep in the house without going into the brooder. We believe that for the early stage of growth the provision of a rearing-shed will yield a good return, and the results will well repay the expenditure. That appears to be the system which has been carried out to a large extent in America, and is now coming more and more into vogue in this country. In Fig. 93 we show an American duck-house on the Weber Duck-Farm, and fitted with runs in which are seen ducks of various ages. Fig. 95 shows a double house for rearing ducklings. It can be built to any size, but we find that, if built 7 feet long by 4 feet wide and 4 feet high, it will accommodate two lots of twenty-five or thirty ducklings after they are a month old.

The plan followed by Mr. Walsh in the rearing of the birds after this stage is past is simplicity itself. In the early part of the season a field is selected which has not been occupied by the ducklings for at least

When the birds are about five weeks old they are removed into the larger runs already mentioned, and kept in flocks of fifty. Here all shelter and cover are absolutely dispensed with, and the birds live in the open air day and night until the time of killing. We are inclined to think that—at any rate, for very early birds—this plan would not yield the most satisfactory results, but it is the method carried out by Mr. Walsh and others. If the weather should be very unfavourable, sacks are hung over the netting on the wind or rain side. It is found that by the system of feeding which will be described later birds can be produced at nine weeks old weighing up to 5 and 5½ pounds; in fact, during a greater period of the year, 60 pounds the dozen is the average weight.

In Suffolk a very interesting experiment has been carried out for some time by Mr. Murrell, who, whilst a native of this country, has lived for several years in

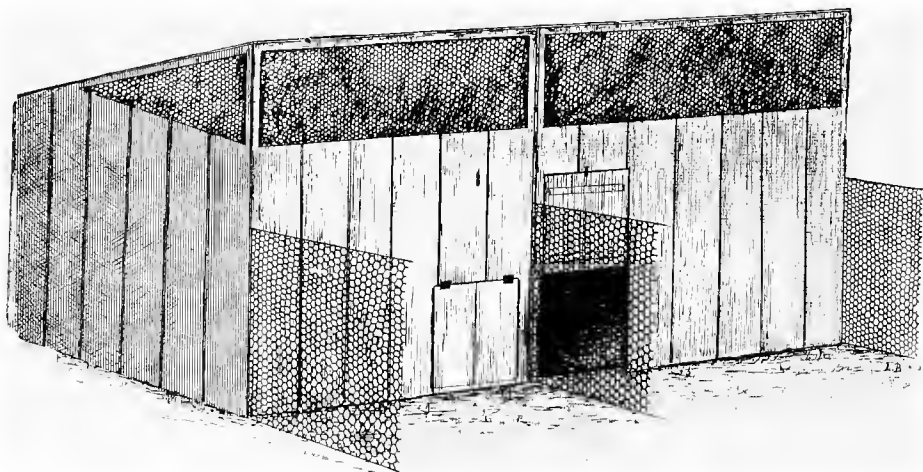


FIG. 95.—DOUBLE REARING-HOUSE FOR DUCKLINGS.

three years, and a man is employed in making runs of about 20 feet square by means of inch-mesh wire-netting, and larger runs of about 25 yards square. In these runs are placed boxes of the simplest character. Everything upon the Walsh Farm is simple, and there is not much capital invested in duck-houses. The boxes are, as a rule, packing-cases, which have been purchased at about 6d. each. They are repaired if required, and the lids are formed into doors, by leather or iron hinges. When 100 of the nine-days-old ducklings are put into one of these smaller runs they will be accommodated in a couple of these boxes, and, with increasing size, another box or two are added. The birds are fed there during the earlier stages every two hours, and later on five times a day. They are only allowed out in the runs for feeding, and as soon as the meal is over they are driven back into the house, and thus are protected from exposure.

Canada and the United States, and there had kept ducks to a considerable extent. In this case there is no hatching whatever, the birds being bought in Norfolk from the farmers, either a week old or up to a month, in accordance with the demand and opportunities. When received, they are placed out upon the fields in small runs, which are formed by means of 50-yard rolls of wire-netting of the usual 2-inch mesh, and 18 inches high. They are only kept upon the same piece of land for a week, and then moved to fresh ground; and with these rolls of netting and short stakes the work is greatly simplified, although the labour must be much more than on the plan adopted by Mr. Walsh. In this case, as in that of Mr. Walsh, the ducklings are only accommodated in sheds or boxes until they are half-grown, after which they sleep entirely in the open air. The idea under both circumstances is that cleanliness should be ob-

served in the houses, but we are afraid that this is not always the case.

To summarize the results of observations both at home and abroad :

1. That ducklings only require artificial heat for eight or nine days ; in fact, in warmer weather they do not require it so long.

2. That fresh ground is helpful to keep them in a healthy state, and that the birds should be divided into flocks of 50 to 100 in accordance with the age.

3. That during the last five weeks of their growth they may be kept in the open air, although we believe that better results will be secured, especially for early stock, by giving shelter.

FEEDING.

It will be realized that a most important part of the work is the feeding and fattening of the ducklings. In the Aylesbury district feeding varies considerably in accordance with individual ideas, and also with what food is available. Many breeders use hard-boiled eggs chopped fine and mixed with boiled rice, though some give toast soaked in water. After three days to a week of this feeding the birds are put upon Burmah rice (carefully simmered) and toppings (which is the local name for fine sharps or middlings), and upon barley-meal and toppings, a variety being given in order to stimulate appetite. The manner of treatment described is continued until the ducklings are five weeks old, by which time they should have grown to a large size. Now a different plan must be adopted, for the frame thus built up must be covered with the flesh, and feeding should be to that end. The ducklings are divided into flocks of about twenty each, as near as may be alike in age and size. The best manner is to feed the birds from long wooden or metal troughs, of which there should be a sufficient number to allow every duck to find a place. The quantity of food can only be gauged by the appetites of the ducklings, and the attendant will soon find out how much is necessary without allowing any waste. It is a great deal better to be rather short than permit them to sicken themselves. No water must be supplied until they have eaten, and then only in small quantities ; and they should not be allowed to swim until a day or so before they are to be killed, when a bath will clean their plumage.

Mr. Walsh feeds as follows : The first week hard-boiled eggs chopped fine are given and mixed with bread, of which he has a large quantity specially baked, having plenty of crumb. The bread is used while quite new, and to the eggs and bread are added a little bran so as to keep the bowels in order. After a week of this feeding the food is changed, consisting of barley-meal, bran, middlings, oatmeal, and maize-meal, according to price. Oatmeal would give the best results, but it is rather too expensive. These

meals are mixed with cooked boiled greaves or fat. In fact, it has been abundantly proved that meat in some form or another is necessary to the development of the ducklings, and that they cannot be raised successfully without it. There is nothing better than tallow-scrap cake, but Mr. Walsh buys large quantities of fat for that purpose.

FATTENING.

When the birds are from five to six weeks old they are put upon food which is calculated to lay on as much flesh as possible. This in Mr. Walsh's case is chiefly Indian meal mixed with fat, but to that is added a little of the best broad bran. There is no doubt whatever that the best results cannot be obtained by feeding upon Indian meal, but it is a question of price. Mr. Walsh's trade is not for the highest-priced ducklings, and consequently he cannot afford to feed upon rice, which undoubtedly would give much finer quality of flesh, as is the case with the Aylesbury ducks.

The plan adopted by Mr. Murrell, to whom we have already referred, is somewhat different. In his case all the period of growth from the earliest stage is upon the following mixture : Oatmeal, 4 parts ; middlings, 3 parts ; bran, 2 parts ; Indian meal, 1 part ; tallow greaves, $\frac{1}{2}$ part in bulk. The food is well mixed and prepared crumbly moist, in that it is steeped with hot water. It is kept always before the birds, so that they can help themselves at any time. Mr. Walsh feeds his ducklings three times a day during the fattening stage.

It may be well here to give a description of fattening as followed in the Aylesbury district.

The food supplied during the final three weeks should be of a fattening nature, and large quantities of greaves or scrap-cake are used for this purpose. Whilst there should be variety in the food so as to tempt the appetite, we believe that rice properly prepared is the finest of all for this purpose, as it is cooling to the blood, lays on flesh without bone, and is easy of digestion. The best rice for feeding is the coarse kind with its husks, called in some places "paddy" rice. It can often be purchased at 8s. to 10s. per hundred-weight, or less, and at that price is a cheap food for fattening. The method of preparation is important, as it must never be given uncooked, and can easily be spoiled in the preparation. If the proportion of 1 quart of rice be taken, 3 quarts of water should be added, and 1 pound of broken greaves, with a little seasoning powder. The whole should then be placed in a pan or copper, and allowed to simmer (not boil) until the rice has swollen and absorbed all the water, which it will do in two or three hours. The rice should then be broken up, and given to the birds when it has cooled down somewhat. For variation, Indian meal mixed with thirds or pollard may be used. In that case the greaves or meat-scrap should be boiled, and

then, with its liquor, mixed in the meal, all making a crumbly, friable mass. Too often the importance of green food during the process of fattening is forgotten, but a supply of such as may be available should be given every day. Nettles, boiled and mixed with the food, are largely used. Fresh lettuces are also good, but they are not to be obtained at some periods of the year, and then cabbage should be substituted. Green food is cooling to the blood, and tends to keep the birds healthy. Another most important matter is that of supplying grit, for without it the ducklings will be unable to digest their food properly. The quantity they will consume is proof of its value, and a boxful should always be within their reach. The best kind is made from fine granite, and it should be broken to the size of wheat. If what are known as road-scrappings can be secured, nothing can be better for this purpose, as they contain an abundance of grit.

Ducklings undergoing the process of fattening should not be allowed to swim in water, but, as we have already said, they must have water to drink. A further point to be observed is that ducklings during the fattening stage should not be disturbed or frightened, and even the presence of strangers will retard growth. We were once refused admission to a duck-yard in Belgium, as it was stated that the intrusion of visitors would practically waste all the food given that day, as the birds would not make any progress. It must be remembered, however, that the system here described is only suitable for birds intended to be killed at an early age. Where breeding-stock is to be raised, the system adopted should not tend to force growth, as this would do harm, and the food supplied should be throughout the whole period similar to that given during the early stages, and after the first two or three weeks—except the weather is very cold—it is better to allow the ducklings access to water, so that they may swim. It will be found that they will be longer in reaching maturity, but their vigour of body will be very much greater.

KILLING.

Ducklings should be starved for twenty-four hours, and are killed by breaking the neck, as in the case of chickens. A barrel should be provided with slots cut in the top, in which one leg is placed, to allow the bird to hang head downwards for two or three minutes, so that the blood may drain well from the body. Then they are plucked completely, except upon the wings and head and 2 inches down the neck. The wings are turned, and the birds laid breasts upwards upon a flat board about 15 inches wide, the heads hanging over the side. As soon as half a dozen are ready, another board is laid on top and heavily weighted. They should be allowed to thoroughly cool, and are packed in baskets holding a dozen, and each lot should be even. Packing ducks whilst warm is a fatal mistake,

often causing them to reach the market in a green state.

COST OF RAISING DUCKLINGS.

The cost of feeding ducklings, as we have already mentioned, is an important item, and hence the importance of early maturity and of marketing during the duckling stage, for profit depends upon whether that is accomplished. Taking into account cost of egg, of incubation, and of feeding, a duckling at nine weeks cannot be produced under 1s. 6d., if the labour is undertaken by the breeder, and to do so requires economy in feeding and management. Where labour has to be paid for, and interest paid on equipment of plant, 4d. to 6d. more must be added, even where the operations are upon an extensive scale. On this scale a duck at fifteen weeks will have cost 1s. beyond the sum named, and will be of less value than it was as a duckling. Of course, where less intensive methods are adopted the expense can be greatly minimized; but the returns will be reduced to an equal extent. The plan we have described will only be profitable for the production of ducklings early in the season, leaving a large margin under proper management and where the conditions are favourable and the markets satisfactory. Feathers enter largely into the question of profit, but this is dealt with in a later chapter.

DUCK-REARING IN THE STATES.

For the following notes we are indebted to Mr. E. T. Brown, of the College Poultry Farm, Theale, who made an extensive tour in America in 1903, visiting many of the leading establishments in that country.

"The duck industry of the States is mostly confined to the large plants, where anything from 500 to 2,000 stock birds are maintained, and where from 20,000 to 50,000 ducklings are hatched, reared, and marketed in the course of the twelve months. Generally speaking, there are no small men; those who rear from 500 to 2,000 ducklings per annum, and many of whom are making comfortable livelihoods therefrom at the present moment in this country, are not met with, so far as my observations go. Whether the system adopted in America is better than that practised in England is a point requiring considerable discussion, and much may be said in favour of both sides; but this does not concern us here. As would be expected, some of the duck plants in the States are stupendous, and conducted on truly magnificent lines. The largest duck plant is that belonging to Messrs. Weber Bros., at Wrentham, Mass. (see Figs. 93 and 96), where in 1903 upwards of 50,000 ducklings were hatched, and ultimately marketed. The farm is 100 acres in extent, situated in a good position, with a large amount of shade. There is a plentiful supply of water, and probably it would be difficult to find a place more suited to the requirements of a duck-farm. A certain

proportion of the land is cultivated—about 60 acres each year, whilst the remaining 40 acres is occupied with the ducks and ducklings.*

"A farm soon likely to become a serious rival to Messrs. Weber Bros.—at any rate, so far as size is concerned—is that belonging to Mr. McFeteridge, who has lately erected a large plant upon the most approved and up-to-date lines, where it is his intention this year (1904) to deal with between 50,000 and 60,000 ducklings, and buildings have been erected and arrangements made for the accommodation of that vast number. His incubator shed is one of the finest I have seen, containing forty-six machines, each capable of holding 360 eggs, making a total egg capacity of

—the Pekin. It is claimed for this, their favourite breed, that it grows quicker, matures earlier, and attains a greater weight than any other known variety, and, in fact, possesses all the requirements of a good marketable bird. It is difficult to understand the cause of this preference for the Pekin, as in this country there are no two opinions regarding the suitability of the Aylesbury for early marketing. The solution probably lies in the fact that the Aylesbury has not had the opportunity of being properly acclimatized, and it is possible that, were the experiment continued over a series of years, very different results might be arrived at. It must, however, be admitted that the Pekins one sees in the States have several points remarkably

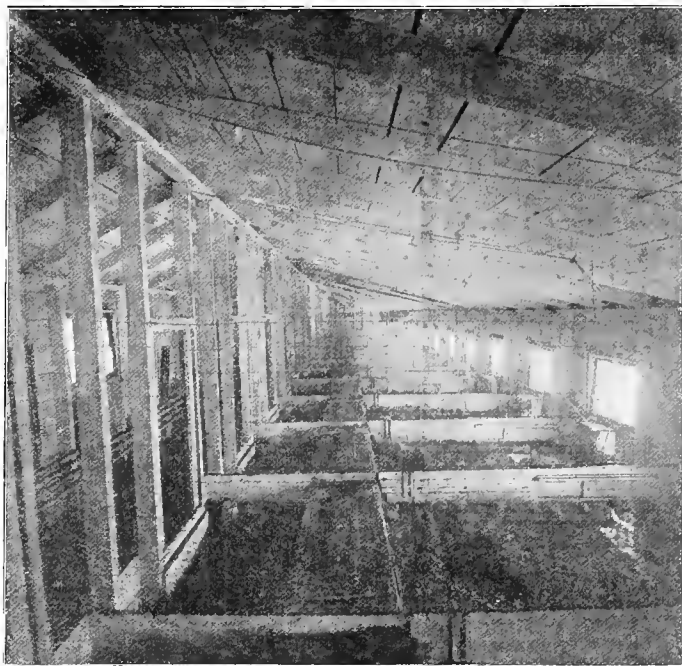


FIG. 96.—INTERIOR OF WEBER'S DUCKLING HOUSE.

over 16,500. At the time of my visit, which was within eight months of the commencement of the plant, he was killing and sending to market 400 birds per day. The proprietor anticipates, with ordinary success, to rear between 50,000 and 60,000 ducklings during the present year.†

"The chief duck maintained in the States is the Pekin, and upon all the plants devoted to the interests of utility duck-raising it is the one and only breed. The Aylesbury has repeatedly been tried, but has never equalled—in the opinion of American poultry-keepers

similar to the Aylesbury. Some of the breeding ducks and drakes I saw were exceedingly fine, many of them weighing upwards of a dozen pounds. As a rule, five ducks are allowed to one drake, although as the breeding season approaches an end the number is frequently increased to seven and eight. The stock ducklings are always bred from the two-year-old birds, whilst those from the youngsters are used for fattening.

"Artificial methods of incubation are always employed for hatching the ducklings, and in no case do I remember being told that hens were used. One duck-raiser told me that he had attempted during three or four seasons to use hens, but the idea had to be

* Fig. 96 shows the interior of brooder-house on the plant of this farm. See Fig. 93.

† See Figs. 97, 98.

abandoned owing to the difficulty of obtaining the hens in sufficient numbers. He was of opinion, further, that incubators were more reliable than hens. The brooder-houses are usually long, low structures, about 12 to 14 feet wide, and anything from 100 to 500 feet in length. In a few cases they are of double width, with

earned there is little to note, as the system varies only in minor details from that practised in this country. A great deal of attention is devoted to the feeding of the ducklings, as it is realized that upon the early treatment so much depends. Messrs. Weber Bros.—and I consider this a typical place—give the duck-

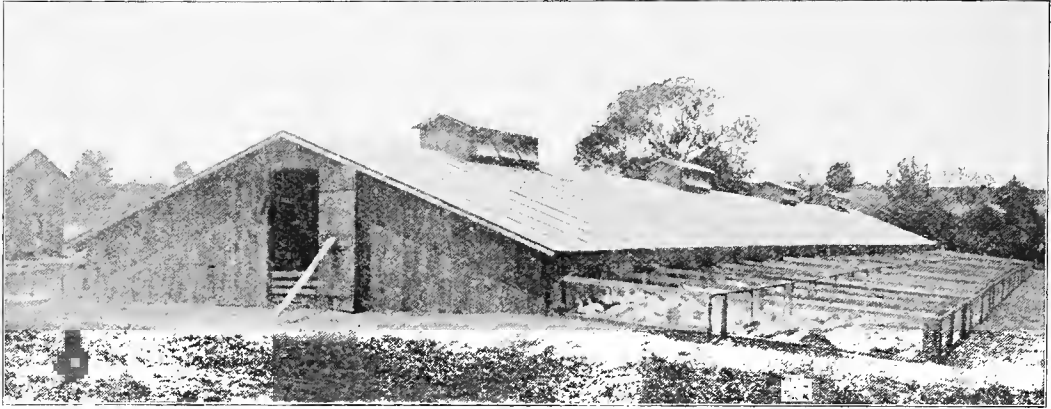


FIG. 97.—THE MCFETERIDGE WARM BROODER-HOUSE FOR DUCKLINGS.

a corridor down the centre. The system of heating with hot-water pipes is generally adopted, and the ducklings as they come first from the incubators are placed at the end near the stove. They are gradually moved every day, or alternate days, away from the source of heat, and thus they are cooled off. Artificial

lings the following mixture during the first week: Shredded wheat, rolled oats, and bread crumbs in equal proportions; 5 per cent. of beef scraps, some oyster-shells, grit, and green food; the whole being moistened with water or sweet milk. This mixture is fed in a crumbly moist condition, not by any means

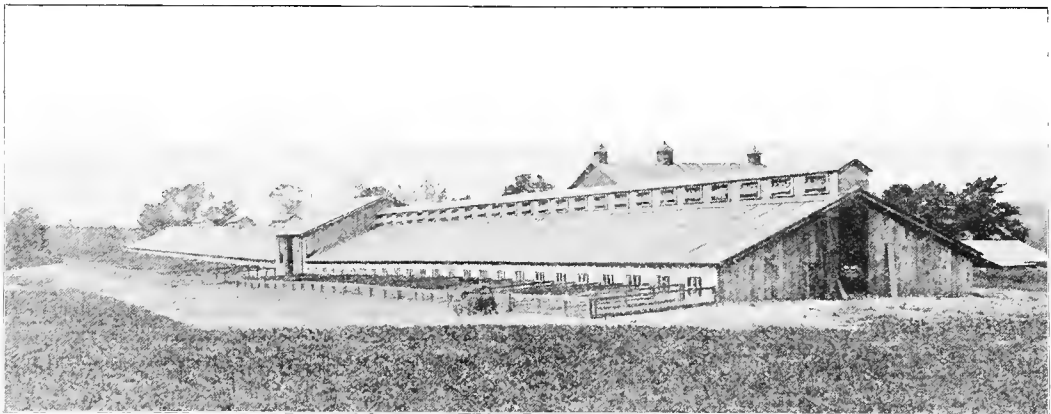


FIG. 98.—THE MCFETERIDGE COLD BROODER-HOUSE FOR DUCKLINGS.

heat is usually supplied during the first fortnight, the exact time depending upon the outside temperature. During severe weather, or with very early hatched birds, it is sometimes necessary to continue the heat for three weeks or a month.

“As far as the feeding of the stock birds is con-

sloppy. After the first week the bread crumbs are dispensed with, and shredded wheat, rolled oats, bran, maize meal, and second-grade flour, together with oyster-shells, grit, and a plentiful supply of green food, form the staple diet. This method continues till the birds are three weeks old, when they are put on what

is termed the growing ration, and the ducklings are fed but four times a day in place of six times as heretofore. The growing ration is as follows: Two parts of maize meal, one of bran and toppings, 10 per cent. of beef scraps, oyster-shell, grit, and finely-chopped green food.

"Fattening commences when the ducklings are about seven weeks old, and the food chiefly employed for this purpose is maize meal, moistened with water, and just sufficient flour to make it adhere together. Occasionally, in order to make a change, a mixture composed of shredded wheat, maize meal, flour, and bran is substituted. The birds are fed three times a day, and the greatest importance is attached to the point of removing the food immediately the ducklings have ceased eating. Flat troughs are used, about 6 inches wide, with 2-inch sides. Water always remains before the birds. Killing takes place by inserting a sharp knife into the slit in the roof of the

mouth when the birds are about ten weeks old, at which age they should average from $6\frac{1}{2}$ to $7\frac{1}{2}$ pounds. Fourpence per bird is paid for plucking, and as some of the experts can pluck from fifty to sixty birds a day, it will be seen that an excellent wage can be earned at such work. It must be remembered, however, that both wages and living are higher in the States than is the case in this country, and thus the amount appears more than it is in reality. Immediately plucking is finished the birds are placed in ice-water until thoroughly cold, when they are packed and sent away. The mode of packing is interesting. Barrels are generally employed for the purpose, and a thin layer of ice is placed in the bottom, upon this a layer of ducklings, more ice, more birds, until the barrel is quite full. This packing in ice is necessary in America owing to the fact that greater heat is experienced during the summer, and the birds have such great distances to travel to market."

CHAPTER XVIII

GOOSE FARMING.

NUMBER OF GEESE—DEMAND FOR GEESE—BREEDS—PLACES FOR GEESE—HOUSES—HATCHING—REARING—FEEDING
GOSLINGS—NORFOLK GEESE—FATTENING—KILLING AND DRESSING—GEESE IN NORMANDY.



one time geese were amongst the most profitable of the poultry kept in this country, but, for reasons to be afterwards explained, that can no longer be claimed.

In 1885, according to the returns then published, there were in the United Kingdom the following numbers of geese :

England	...	...	...	...	615,724
Wales	...	...	...	...	234,146
Scotland	...	...	...	...	35,440
Ireland	...	...	...	...	2,133,609
Total	...	...	...	...	3,018,919

Of these, there were 69·4 per cent. in grazing counties, and 30·6 per cent. in corn counties.

DEMAND FOR GEESE.

We are inclined to think that the number of geese now kept in England and Wales is less than in the year named, and in 1903, according to the Irish agricultural statistics, the number had been reduced to 1,768,522 in that country. This is entirely in accordance with our observations upon the markets, as it cannot be questioned that there has been a considerable reduction in the demand for geese. During the last few years, due to changes in taste, the sale of geese at the Christmas season has fallen off very considerably in many parts of the country; and in an article which the writer contributed to the *Journal of the Royal Agricultural Society* in 1899 the observations of traders in different parts of the country were given, proving that the statement here made is generally true, the exceptions being in the West Riding of Yorkshire and in Nottinghamshire. As further evidence of this fact, the supplies of geese from Normandy prior to Christmas have been reduced very considerably. The explanation is that at one period the goose was the staple dish amongst large sections of the community at Christmas, but turkeys are now preferred.

Hence the prices obtained for geese are not nearly so satisfactory to producers and fatteners as was the case a few years ago. We believe, however, that in the future this trade can to some extent be built up again, but at a different season of the year. In 1902 the author took an extensive tour through South Germany and Hungary, and found in all the markets enormous quantities of geese. These were, however, of a much smaller size than those we are accustomed to see upon our Christmas markets, weighing about 7 to 9 pounds. We believe that it should be our object to market the geese more in the autumn than at the Christmas season. The demand for turkeys at Christmas is likely to increase, whilst that for geese will decrease. Under these circumstances it would be distinctly beneficial if we could create a demand for smaller birds amongst those who cannot afford game. To do so, however, we shall have to change our methods of breeding and seek rapid-growing birds, avoiding the huge specimens which have been the main object of our operations for many years. We found in the countries already named that the geese kept are more of the Embden type, not being bred for size. In America the Chinese goose is kept extensively, and that, either pure or crossed with the Embden, would give the class of goose which is required. In this connection we must recognise that the day of big birds is over, and that were smaller birds produced they would be equally profitable with the larger specimens, as they would be bought up more rapidly. We believe that it would be possible to create a desire for them on the part of the consuming public. A fleshy bird of 8 to 10 pounds would be finer in meat qualities, and would be in demand by a class which at the present time does not enjoy the luxury of this fowl.

BREEDS OF GEESE.

TOULOUSE.—Often called the gray goose. Large, deep-bodied fowl, very massive in proportions, the

breast extending well in front of the legs; head and bill very strong, and the throat dewlapped; greater part of the body dark gray, shaded brown, with feathers laced with a light shade of gray; under parts and tail white. Toulouse geese, as a rule, are non-sitters, but very good layers; they are somewhat slow in reaching maturity, and are suitable for the Christmas trade.

EMBDEN.—Entirely white in plumage, with flesh-coloured bill and orange-coloured legs and feet; not so prominent in front as the Toulouse, and more erect; matures rapidly, and suitable for the autumn trade; can be fed up to a great size for Christmas.

AFRICAN.—Very large, long in body, well developed in breast; neck moderately long; head rather large and with a heavy dewlap; black bill and knob on front of head; plumage on back, wings, and tail dark gray, shaded to light gray on the breast and under parts; adult birds frequently reach 20 pounds; a poor layer.

DANUBIAN.—Sometimes called the Sebastopol goose; found in South-Eastern Europe; generally white in plumage, and very similar to the Embden, except that the hind-quarters of the body are covered with loose shaggy feathers, which give an untidy appearance; these geese are moderate layers, but very good sitters and mothers; gentle in temperament; quality of flesh moderate; a small-sized goose.

CHINESE.—Very similar in type to the African, but smaller in size, and with greater erectness of body. There are two varieties of the Chinese, the brown and the white; excellent layers; good in quality of flesh, and very hardy; they do not dress well pure, but are excellent for crossing with the Embden.

CANADIAN.—A recently domesticated American wild goose; large in size; a moderate layer; excellent in quality of flesh; gray in colour.

EGYPTIAN.—A small goose, with some resemblance to the African, but yellow, red, or brown in colour; not of much value for practical purposes.

RUSSIAN.—In Russia there are two varieties of geese, the Arsamas and the Tula, bred to the south of Moscow; these are large-bodied birds, with a very peculiar head and short bill, and were used at one time for fighting purposes; excellent in quality of flesh.

PLACES FOR GESE.

The best places for keeping and breeding geese are on the borders of commons, moors, or waste lands, and there is an abundance of places in all parts of the country where flocks might be kept, thus utilizing ground of no value at present, and, by providing profitable labour for farmers and cottagers, add to their incomes. All they will need for food, except when fattening up, will be a little corn or meal at night, and they will forage for the rest; but it is better if the

number kept is sufficient to let a boy drive them to their feeding-ground and tend them during the day. They should be under cover at night in a comfortable house, and with good straw bedding. A pond or stream is by no means imperatively needed, but when it can be given is conducive to their well-being.

It is an interesting fact that in many respects geese are very similar to sheep, and whatever land is suitable for one is equally favourable for the other. Formerly a feature of rural life in this country was the common lands, and under these circumstances cottagers had opportunities of keeping geese which would not be found where the ground is enclosed. The writer can remember how that at one period many labourers reared a flock of geese upon the commons, and where these still remain that custom is followed. It may be accepted as a recognised fact that it is much better for the work to be divided between rearing and feeding; land which is suitable for the former is frequently not calculated to give the best results in the final stages. There are vast areas throughout the United Kingdom where large quantities of geese might be raised, especially upon the higher lands, and sold to farmers in other districts about the time of harvest. That system is carried out at the present time to some extent, and considerable quantities of goslings are landed at the eastern ports of England from the Continent and at the western ports from Ireland. It must be recognised that heavy flocks of geese are not suitable in arable districts, nor should they be kept thickly upon pasture land. The goose is by nature a grazer, the structure of its bill enabling it to eat grass very closely, and their weight of body would injure growing crops of every kind. Hence the breeding stock should only be kept upon the open and poor lands, and the present system is one which conduces to the most satisfactory results, as in this way they do not displace any other class of stock. Breeding stock must have liberty, and it is well to remember that these birds do not attain their maturity until they are two years of age; consequently, it is undesirable to attempt breeding from very young stock.

HOUSES FOR GESE.

The goose is a hardy bird, but at the same time requires protection during unfavourable seasons of the year. In the next chapter Fig. 101 shows the design of a very useful form of house which is equally suitable for geese as for turkeys, where a special building must be provided. In the majority of places, however, some vacant farm building can be used in this way. The house should be large enough to allow 6 square feet of floor-space for every bird, and whilst there should be perfect shelter overhead, it is better to either partially or entirely net or bar the front of the house, so that the birds may have plenty of fresh air. The building should be lofty and well ventilated, and we prefer

erections which are at least 7 feet 6 inches in height. It must be thoroughly dry, and a great amount of loss will be avoided if care is taken in this direction. Although geese are waterfowl, the same remarks apply as in the case of ducks, and it is better if the floor is elevated a little above the level of the outside ground, so that there may be no danger whatever of dampness. It is an excellent plan to litter out the house well with straw or dried leaves, either of which form a very valuable manure when impregnated with the droppings from the birds, which must be driven in at night. If their food is given in the evening, there will be no difficulty in securing their return home.

HATCHING.

Young geese commence laying about the middle or end of February, and older birds a month later. It is much better to breed from the more mature birds, yet if early broods are required the latter cannot be waited for, as they are considerably later in commencing to lay. When the strain is a good one—strong, and not at all inbred—then the eggs from young birds can be taken without fear, and will hatch out well, the only drawback being that they do not grow quite so fast as those from older stock. In the case of white geese, if the eggs are left in the nest, as soon as about fifteen are laid the mother will show a desire to sit; but if they are removed regularly, she will probably lay nearly twice as many before desiring to do so. The latter is the plan usually adopted, and half the eggs are generally set under ordinary hens such as Cochins or Brahmas, giving four to each. Some breeders never allow a goose to sit at all, considering that they are not safe to trust, being so heavy and clumsy. If this plan is adopted, the eggs must be regularly sprinkled in the nest, as the shells are very hard and thick, or otherwise the young birds will not be able to break through. Some geese lay two clutches of eggs in one season, but they have to be early bred and from a good strain to do so.

The time of incubation for geese is thirty days, and it is better not to disturb the nest during the time, except in case of accident, as the mother is very spiteful and pugilistic. Should her mate be near, it may even be dangerous to do so, as they have great power in their wings, and can deal a tremendous blow. A regular attendant, however, soon becomes familiar to them, and he need not be so careful.

REARING.

As soon as hatching is over, plenty of food and water should be placed near the goose, so that she may satisfy her own appetite, and then both her mate and herself will attend to the little goslings. It is well known that the management and food during the first

few weeks of any animal's existence determine very largely the future size and the rapidity of its growth. Of course, there are great variations in breeds as to their capacity for putting on flesh freely and rapidly, but very much can be and is determined by early treatment and management. No bird that is neglected and half fed during the earlier stages of its existence can possibly thrive, and it is essential to begin from the first with proper feeding. Goslings are about the easiest of all domestic poultry to rear, and when once hatched require very little looking after. They are unlike chickens in that they do not require brooding to the same extent. When hatched, place them in a roomy coop or crate, but it is better not to give a large run at first. The coop must be situated in a sheltered position, as the sun's rays are very fatal to young goslings. Of course, if there are plenty of bushes or trees about, that is simple, for the coop can be placed under their lee; but if the situation is open and bare, some shelter must be improvised. The coop can then be made with a large eaved roof, but in addition hurdles, in which has been interlaced furze, should be provided, and if freely scattered about these will be welcomed by the goslings. It is an excellent plan to cover the coop with furze, as that keeps it cool. In all cases the coop should be bottomless, for the goslings are unable to hold their feet on a wooden floor, and are very apt to injure themselves by slipping about. It is not necessary to go to much expense in the making of a coop, for it can be built at a very reasonable cost, and does not require to be very strong. Goslings are not usually hatched until the weather is open and mild, and are not delicate by nature; but the coop should be made roomy, as the youngsters grow very fast. When about ten days old they can be liberated from the run, and will prove splendid foragers.

FEEDING GOSLINGS.

The early feeding must be all in the direction of building up a frame on which the flesh may be laid. The best food from the first is wheat and oatmeal, or barley-meal and wheat. The whole grain should be scalded and dried up with meal. Variations may be made by giving ground oats, or by boiling potatoes and drying them up with the meal. When about two months old the birds may be fed on raw grain and sliced potatoes. They are also very fond of young grass, green onions, chickweed, and an early cabbage hung within their reach will be highly appreciated. No other special provision is necessary except the giving of water, which must not be forgotten.

Young goslings, if the fields are clear of their crops, should be allowed to wander about most of the day when the weather is at all fine, but they ought to be placed under the care of a lad, so as to prevent their wandering away too far and overrunning themselves.

A lad can easily keep them in order and bring them home at night.

For reasons which have already been explained, economy in feeding is most important in connection with goslings, and every ounce of unnecessary food given is to a large extent wasted. In many districts, especially on the richer soils and during a fairly moist summer, with the exception of a little food—say, any good meal made into a paste in the morning and a few oats or wheat steeped in water in the evening—they will not require any food at all. They are essentially grass-eaters, and will find practically the whole of their

geese, is profitable in a moist summer, by reason of the small amount of food which is required, it would be unprofitable during a very dry season. Further, there are affections to which geese are subject during very dry seasons. These we have found in different parts of the country, more especially a lameness, the birds showing signs of weakness on the legs when about three weeks old, and gradually pining away. The evidence is that the affection named is a lung trouble, aggravated by an excessively dry situation. It is necessary, therefore, to adopt methods in accordance with the season of the year.

NORFOLK GEESSE.

If we look to the great geese-raising districts of England, we shall learn something of the method adopted where the best specimens are bred. In Norfolk the trade resolves itself into two great branches—green geese and Michaelmas, the Christmas trade being really a continuation of the latter. Farmers, as a rule, do not attempt fattening, which process is left to the dealers, who lay themselves out for it. In March and April dealers begin to get in their gosling supplies from the farmers or cottagers near the commons, and, as a rule, these goslings are about five or six weeks old, and very thin. They are fed for six or seven weeks under stages on barley-meal, maize, wheat tailings, and brewers' grains mixed, which food soon makes them ready for the green goose market. These stages or pens give them sufficient room to move about, but not too much, and they are kept there for all the period, being allowed out now and again for a bath and for cleaning the pen. Michaelmas geese take their places under the stages in August, and the endeavour is made to have them ready for market before the Irish and Dutch supplies begin to arrive. On turnips geese are found to be capital substitutes for sheep, and when a dealer has a turnip-field he not unfrequently hurdles off a portion and eats it off with them. They first eat the tops and then the bulbs of softer turnips; but when they are put upon swedes the man in attendance gives each root a chop. Geese will eat a field cleaner than sheep, and their manure is equally good. When fed in this way they need nothing more than a trough of water, and the finishing process consists in putting them under stages for a month, and feeding them on brewers' grains and meal. Gravel or grit should always be supplied as an assistance to digestion.

In the autumn large numbers of young Irish and foreign geese are offered for sale in nearly every market town, and at reasonable prices. These have been sold by breeders to dealers, the former having in many cases no accommodation for fattening, and farmers whose grain is off the land will generally find it profitable to purchase a flock



FIG. 99.—FOREIGN GOOSE.

FIG. 100.—ENGLISH GOOSE.

sustenance. This is especially true in a country like Ireland, where the moisture in the atmosphere keeps everything green. The goose-raiser should bear in mind that his business is not to substitute artificial for natural food, but to give the former in order to make up for any deficiency in the latter. During a very dry summer the birds will require to be fed constantly, because at that season there is no natural food available, and consequently they must be provided with an abundance, more especially of green food. It must be conceded that whilst goose-rearing, more especially if a demand can be created for Michaelmas

of these birds, which can be put out upon the fields, where they will pick up a great proportion of food required by them for the next few weeks. After roots, also, they can be put on the land. There are many opportunities which the farmer possesses of keeping these birds, and they need as little care as almost any kind of farm stock.

FATTENING.

Geese are altogether different from ordinary fowls, or even ducks, in one respect, and a mistake is sometimes made in the final fattening off, by putting each bird into a separate compartment. Geese never thrive in this way, and instead of getting fatter actually pine away. They appear to be miserable without company, and each lot should be killed together, or the ones left behind rapidly lose flesh. Some birds fatten quicker than others, and as they are seen to get into ripe condition, which can best be decided by the state of their appetites, they had better be killed off. As soon as they are as fat as they will be, the desire for food begins to slacken, and then it is that they should be despatched, or they will lose flesh instead of gaining it. The food should be soft in the morning and corn in the afternoon, a large trough of clean water being always at hand, but not so that they can get into it. The soft food may consist of barley-meal mixed with Indian meal and pollard, and the corn of wheat and barley, which are better if steeped. Plenty of grit must always be provided.

When the system suggested is regularly carried out year by year, arrangements can be made with breeders to supply goslings in the autumn. Never mind if thin and lanky, those faults can soon be remedied, but avoid any that have the least appearance of being stunted in their growth, for such do not thrive well, never attain the size required, though they may eat nearly as much as the others. Goslings in summer may be bought at about half a crown each, or even less in quantities, and six or eight weeks' fattening, at a cost of sixpence per week, will bring them up to a dozen pounds weight and upwards, according to the length of time they are so fed. Thus, it will be seen that the margin to pay for trouble, and as profit, is a sufficient one. But a greater amount of expenditure would not be profitable.

KILLING AND DRESSING.

Mr. J. S. Rawson, a well-known breeder of geese, thus describes the best methods of killing and dressing: "Before killing a goose, it must be kept without food for at least twelve hours, though fifteen or eighteen hours will do no harm; this clears the crop of all food, a very necessary point to be attained. Having fasted the goose for the time required, the next part of the business is to kill it as expeditiously and in as painless a manner as possible. There are two or three ways of accomplish-

ing this, but the best is by piercing the brain with a knife. Secure the bird's legs with a piece of twine, and then feel for the correct spot at which to insert the knife. At the base of the skull, and at the point where the head is joined to the neck, will be found a hollow place without any bone to protect it; here is the vulnerable point. Now hold up the bird by the legs, and with a stick or short piece of wood give it a smart blow at the back of the head, thereby rendering it unconscious. It must now be held between the knees, the head being grasped in the left hand, bill down, and neck somewhat bent, so as to get a better chance of finding the base of the skull. This having been done, a sharp-pointed and strong pen-knife is inserted in the hollow place before mentioned, and a quick stab or cut given. If this is properly done, one of the chief arteries is severed, and the bird quickly bleeds to death, care being taken that in the meantime it is firmly held, and prevented from throwing the blood over its feathers or the clothes of the operator. As to the time for plucking, that is a matter on which opinions differ, some people preferring to do it at once, whilst others aver that it is better policy to let the bird grow quite cold before it is taken in hand. In the former case the feathers will be found to come out much more readily, and the time occupied in plucking is thereby very considerably diminished; but, on the other hand, the skin and flesh being more tender, greater care is required during the operation to prevent the membrane being torn. The usual plan is to leave the head unplucked, and thus let it act as a sign-board to tell the nationality of the bird, whether it be a large duck or a small goose. Care should be taken of the feathers, and these ought to be separated into three lots, the first containing down only, the second small and fine feathers, and the third division strong quills. The latter may be peeled and the feathers afterwards mixed with those of the second division.

"If the poulterer requires the geese *ready trussed* as is not unfrequently the case, the following is the method to be observed:

"After plucking the goose, it must be carefully singed, drawn, and wiped out with a damp cloth. Then cut off the neck as near the back as can be done, leaving the skin long enough to draw over the stump. Next cut off the feet at the first joint, and do the same with the wing pinions. To make the bird look plump, press in the breast bone, and run a small skewer through the lower part of each wing. Now draw up the legs, and skewer them through the centre, into the body; when this done, two more small skewers are needed to complete operations by fixing the shank of each leg to the side-bones. It is now in proper shape for the spit, the only thing that requires doing being to cut off the vent and make a hole large enough to pass the rump through, in order to keep in the seasoning when served at table. The goose should now be laid upon a stone or marble slab, and if the dressing has been done

shortly after killing, it will be necessary to allow it to stiffen and cool before packing for market. To improve the colour of the flesh, it is a good plan to wrap it in a cloth which has been dipped in old milk, and afterwards wrung nearly dry. Geese, and in fact every kind of poultry, ought to be killed at least twenty-four hours before they are packed to go away, and great care should be exercised in the latter operation, in order to prevent bruises, or disfigurement of any sort. In following out the above directions, the giblets must not be overlooked. These delicacies should be put on one side, together with the liver and gizzard, and sent along with the goose to the poulterer."

GEESSE IN NORMANDY.

For our Christmas markets vast quantities of geese and turkeys are imported from Normandy, and in December, 1897, there were landed at the ports of Newhaven and Southampton no less than 2,213 tons of these two species from the province of France named. The following observations were made by the author during a visit to La Sarthe.

The La Sarthe country is a very fine one, with much more of cultivated, or rather arable, land than is met with in Northern Normandy. It consists of plains and valleys, very rich, well cultivated, and essentially picturesque. Therein poultry are largely kept, and the skill with which the fowls are produced indicates that desire to excel which is the greatest promise of success in any pursuit.

Whilst all kinds of poultry are bred largely, in the winter season geese and turkeys (more especially the former, for turkeys are bred to a greater extent to the north-east and south-east) specially predominate. Farmers all around the district breed geese considerably; but the great centres are Sille-e-Guillaume and Brulon to the west, and Ballon to the north. Still, this rich, succulent bird is to be met with on all sides, and his somewhat discordant cry is heard everywhere. The places just named are where a great amount of fattening is done, and thereat the goose is as much looked to as are ducks in Bedfordshire and Buckinghamshire, and chickens around Heathfield and Uckfield, in Sussex. Our observations show that the great bulk of the geese are a very apparent cross between the white and the gray.

As already stated, the farmers breed geese to a considerable extent. Not that there are huge flocks to be met with, but on most farms 50 to 100 birds are annually produced. They are in the autumn sold to fatteners, who vary greatly in the number they feed off. We visited one place in the Ballon district, where 200 to 300 are handled at a time, whilst at other places five to ten times that number are fed. The best quality is said to be produced at Sille-e-Guillaume and Brulon, whilst the largest come from Ballon and the district around Montbizot, the station for Brulon.

The premises in which these are fattened are, in many cases, not very presentable, and certainly do not compare at all favourably with those used by the East Anglian farmers for the same purpose. But when we consider the houses and farm buildings generally in France, and compare with them such as are to be met with at home, it is scarcely to be wondered that this should be so. As a rule, old sheds of any sort or kind are turned into fattening places for the geese; and even open pens are employed, though with them are rough sheds into which they can go at night. Of course, geese are by nature dirty, and the places where they are kept are by no means attractive. Nor are they so clean as might be the case were more care taken in this respect. In short, the whole condition of things approximates more nearly to the methods adopted in some parts of Ireland than to what is usual in the hands of our best English feeders. That a dirty state like this is desirable, much less essential, to poultry-rearing and fattening cannot be conceded for a single moment.

The method of feeding adopted by fatteners is very interesting, and in this respect there can be no question that French producers deserve every praise. They realize the importance of properly finishing off their work, and some of the fattened geese we have seen in Le Mans were really remarkable for colour, firmness, and quantity of flesh. But, be it noted, the finest specimens do not come to England. Buyers at home will not give the prices which can be obtained in Paris, and hence the birds are sent to the French metropolis, where there is always a large demand for the best of everything in poultry flesh. This is true in other districts also, and of other products. Really fine geese sell in Le Mans for from 1s. to 1s. 3d. per pound. These prices can be matched in Norwich Market before Christmas; but, with the carriage and other expenses, it will be evident that Le Mans birds would be more expensive in London than those from Norfolk, and they would be "foreign," which counts for something.

To produce the finest geese, the birds are divided into flocks of twenty, each of which has a separate pen, and are fed upon steeped buckwheat. The food is placed in long troughs, which are filled with water, and upon it they are fed three times a day. So far as our observations go, no milk is used, yet the flesh is beautifully white, without any trace of fat, and has a firmness which is most desirable. We were assured that meal, even buckwheat-meal, does not produce the same quality as when the whole grain is employed. Personally we have found steeped oats one of the best things for fattening geese, and the same principle is thus observed. The process of fattening occupies three to four weeks, and when killed the birds are either sent direct to the merchants or sold in Le Mans Market, and these merchants pack and bring over to London.

CHAPTER XIX.

TURKEY BREEDING.

DEMAND FOR TURKEYS—BREEDS—BREEDING—SUITABLE CONDITIONS—HOUSES AND ROOSTS—HATCHING—
FEEDING—REARING—THE GROWING PERIOD—FATTENING—KILLING AND DRESSING.



OR at least 300 years the turkey has been largely in demand as a table fowl, but for a long period of time its use was almost entirely confined to the wealthy classes. Within the last thirty years, however, increasing supplies from abroad, and also advancing incomes on the part of large masses of the population, have greatly stimulated the demand for these birds.

DEMAND FOR TURKEYS.

At the Christmas season the sale is enormous, and throughout the country many households where formerly either a goose or piece of beef would have been the *pièce de resistance* at the Christmas dinner-table are now graced by a turkey. In all parts of the United Kingdom the number of turkeys kept has grown of late years, but not sufficiently to meet the demand. At the same time, there has been a large increase in the imports, but these have only provided for a portion of the trade. Our estimate is that about a million and a half of turkeys are consumed in this country at the Christmas season, of which nearly half come from abroad. During the winter of 1902 to 1903 prices were greatly enhanced in consequence of deficiency of supply, and in London alone 50,000 to 100,000 more turkeys could have been sold than were received.

In the case of turkeys there can be no question that the larger and better fatted birds command the highest prices; in fact, in many of the best centres for consumption the price is graded in accordance with the size. For instance, recently we saw in a retail poulterer's Christmas price-list that turkeys under 10 pounds in weight were 10d. per pound; from 10 pounds to 12 pounds, 1s. per pound; from 12 pounds to 16 pounds, 1s. 3d. per pound; from 16 pounds to 20 pounds, 1s. 6d. per pound; and above 20 pounds the prices become fancy, sometimes as much as 2s. and 2s. 6d. per pound being given for these mammoth specimens. These prices, however, are for the best

qualities of British, Irish, or French turkeys, as the specimens which come from South and South-Eastern Europe are generally sold by the piece and not by weight. One can then buy amongst these specimens birds at 6d. per pound. Although they have considerably improved of late years, yet they are dry in flesh, and cannot compare with the finest production of Western Europe. At the same time we believe that the rage for large birds is an economic mistake. It is partially explained by the fact that business firms make presents of turkeys at Christmas, and it is not with them so much a matter of price as of securing something exceptional. Personally, we believe that the medium-sized specimens—assuming, of course, that they are well fatted—are much finer in flavour than the larger, as the latter are coarser in texture of flesh. For our own preference we should at any time select a meaty hen turkey of about 12 pounds in weight to one twice that size.

BREEDS OF TURKEYS.

The following are the leading breeds of turkeys:

BLACK.—Frequently called the Black Norfolk, although it is probable that the French Black and the Norfolk were of the same family. These birds are dull black in colour, with a few brown tips; medium in size; very fine in flavour of flesh; not much met with in this country, having lost vigour as a consequence of want of care in breeding.

CAMBRIDGE BRONZE.—Apparently a cross between the American Bronze, the Black Norfolk, and an old type of gray turkey found at one time in East Anglia. These birds are much more vigorous than the Norfolk, and, whilst not attaining the size of the American Bronze, are much finer in meat qualities; they are a dull bronze in colour, with grayish reflections. For market purposes the breed stands pre-eminent.

AMERICAN BRONZE.—The largest turkey we have, frequently reaching 40 pounds in weight; brilliant in plumage; very prominent in breast, and of great size.

They are chiefly exhibition stock, lacking the fine meat qualities of the Cambridge Bronze.

WHITE.—Largely distributed in South Europe; called in America the White Holland; burnished white in plumage; medium in size, fairly healthy, and excellent for ornamental purposes.

NARRAGANSETT.—Only met with in America; plumage black, each feather with a broad band of light steel gray edged with black; they are said to be excellent layers, and to mature quickly, meeting a demand for small birds in the early autumn.

ITALIAN.—A small bird, dark gray in plumage; only moderate in quality of flesh.

There are other colours of turkeys, notably the fawn and the lavender, but these are purely ornamental.

BREEDING.

It is desirable to remember that the turkey is essentially a farmer's fowl, requiring all the scope which can only be met with either in parks or upon farms at all periods of their development. This fowl is unsuited for breeding under restricted conditions, and no one who has not an abundance of room would be justified in taking up the pursuit. Moreover, turkey-raising is an industry more suited to those who occupy larger or medium-sized farms than upon small holdings. There can be no question that under suitable conditions, where plenty of space is available, there is no branch of farming which can be made to yield a greater amount of profit; but the number of turkeys must in every sense be relative to the amount of land available, and that land must be cultivated in the regular manner to its fullest extent. We do not think that any farmer can hope to produce for marketing purposes much more than one turkey per acre—that is, assuming his land is cultivated in other ways. There is no reason whatever why in many parts of the country turkey-raising should not be increased enormously, and the experience of the past few years has been that there is a great deal of leeway to make up before the demand at the Christmas season is provided for.

SUITABLE CONDITIONS.

It is, however, a very common impression that turkeys are delicate, and there can be no question whatever that during certain stages of their growth they require careful attention. A word is said with regard to this delicacy in another paragraph, but our point here is to recognise that under many conditions the turkey would be found delicate by reason of the unfavourable nature of the soil. These birds can withstand cold, and even rain does not affect them so adversely as many people imagine, because it is well known that there are vast quantities of turkeys raised in Ireland and in some of the western districts of

England. The question which anyone who is taking up turkey-farming must consider is the nature of the soil. Damp and heavy lands are fatal to success, and neither breeding stock nor the young birds will thrive or prove profitable under such conditions. As we have explained in the chapter dealing with climate and soil, heavy land is colder by reason of the large amount of moisture contained therein, and this checks the growth of young and adversely affects the older birds. Moreover, even if the turkeys are grown to a killing age, their flesh will never be so good as if they had been raised upon a more kindly soil. We do not advocate for one moment that they should be kept upon sand, for the nature of sandy soil is by no means as favourable as is often imagined. The better the land, provided that it is light or medium in its nature, and well drained, the better the turkeys will be and the less trouble will they cause to the owner. We believe that the class of soil which is most suited to this industry is where it is hilly or undulating, as there the drainage is generally much better, but under these conditions it is undesirable to attempt rearing the birds in the lower valley lands, as these are generally damp. Any farmer, therefore, who is contemplating extending his enterprise and raising considerable numbers of turkeys should, in the first place, consider the nature of his land. If it comes within the category we have mentioned, even though the elevation should be considerable, there are no objectionable external reasons relating to the position. Flat land, it is obvious, is not nearly so good, as it is seldom well drained, although large numbers of turkeys are raised in the neighbourhood of the fen country. A further point to consider is that wherever turkeys are bred there must be plenty of natural shelter. Hence we should be inclined to shut out considerable areas of country which are practically treeless, and where, consequently, the birds would be unduly exposed. It has already been shown that turkeys are essentially farm stock, and that the greatest amount of success will be achieved by those who have plenty of space, more especially—as we shall afterwards show—because absolutely fresh ground must be provided for the young birds each season.

Within the last few years several attempts have been made in this country, although the same plan has been carried out previously even as far back as 300 years ago, to breed turkeys under natural conditions. The stock are placed in woods and allowed to live there in the way which would be the case in their wild state. No interference takes place with them; they breed when and where they like, and when the number gets beyond a certain stage, or when any birds are wanted, they are shot. This system deserves encouragement simply because it should be the means of providing those who raise turkeys for market with vigorous stock birds, and in this manner correct the tendency, which is always evident under domestication, to enfeeblement.

But to claim that this is the only way in which turkeys should be bred is to absolutely ignore the fact that the industry is not intended merely for the purpose of providing either sport or pleasure for a few wealthy folk, but as a means of income for our agricultural community. If turkey-raising were to be restricted to the conditions we have named, for every hundred who now raise these birds there would be only one who could possibly do so. We must therefore disclaim any desire to support the contention, which utterly ignores the economic question so far as our farmers are concerned, and which, by exalting a system admirable in itself, is of no practical value to the great majority of our farmers. At the same time, there can be no question that woods and trees will be very helpful in the keeping and raising of turkeys, not only by reason of the natural shelter they afford, but also that, as we shall afterwards show, the turkeys prefer to roost in the trees rather than under cover. There can be no doubt that they are healthier under these conditions.

Much has been said as to the delicacy of turkeys,

HOUSES AND ROOSTS.

The question as to whether turkeys should be housed can only be answered when we have studied the conditions under which they are kept. Much has been said in favour of what is termed the natural system, and upon a farm where there are large trees, with thick, well-clad branches, there is no reason whatever why, during the greater part of the year, the birds should not be permitted to roost there; in fact, they will be healthier than if they are kept under cover. These remarks only apply to young birds after they are from two or three months old. If such trees are not available, or if they are not placed under suitable conditions, then some form of house is required. Under no circumstances should the birds be kept with other fowls, as this is bad for both races. The turkeys must be given a shed or house which is devoted to them alone, and for this purpose we require a building that is lofty, not less than 9 feet in height at the eaves, so as to allow plenty of head room, and there should be at least



FIG. 101.—TURKEY-HOUSE.

and many surmises made with respect to its cause. Our view is that, as the turkey does not attain its full maturity until the third year, it is better to breed from fully grown birds than from young ones, but the latter lay very much earlier than the former, and consequently are frequently used on that account. If these are good, strong birds in their second year, they may be bred from, and the produce will come in useful for early sale. It is desirable to change the male bird every season, and the cock bought in the early spring can be fattened and killed off the following Christmas, when it will be no worse for its service, and probably will bring almost as much as was given for it. If the plan suggested is adopted, some of the young hens can be kept for breeding purposes, whereas if no change in the cock is made that cannot be done. The farmer should never use a cock of his own breeding for stock, if in the least related to the hens, for turkeys are delicate to begin with, and in-breeding makes them more so. Eight hens are sufficient to give to one cock, and it is to be noted that one service will fertilize a whole clutch of eggs.

15 square feet of floor-space for every bird. Fig. 101 shows one of the best forms of houses for this purpose; the front, instead of being solid, is made of strong laths of wood, so that the birds are thoroughly protected, but have an abundance of fresh air, and even if they are allowed to roost in the trees during the warmer months of the year, a house like this can be employed during the winter months, or it may be safely occupied throughout the entire year. The illustration shows a house 40 feet long by 15 feet wide, and 10 feet high, which would allow accommodation for forty turkeys. In this house should be placed portable perches, such as are shown in Fig. 102. These perches are better if they are made in short lengths, and removable, standing 3 feet above the ground. The floor should be thoroughly dry, and may be covered with peat-moss litter, but the space in front of the perches being littered with cut chaff will help to bring the birds home at night, as the evening feed can be scattered there, and they will scratch for it. Of course, a house must be thoroughly clean, and a little finely-slaked lime will help if it is spread now and again over the peat-moss

litter, which should be raked over regularly. Perches of the same kind can be used in the open air, because some breeders prefer their birds to roost upon perches under trees rather than allow them to roost in the trees themselves. The perches should be made of fir-poles $1\frac{1}{2}$ to 2 inches in diameter.

HATCHING.

One of the peculiarities of the turkey, due to her recent domestication, is that she prefers to lay in a nest of her own choosing. Up to the present time artificial incubation has not been found successful in connection with turkeys, although one of the leading turkey-breeders in Suffolk, Mr. Gage Harper, employs an incubator for use in the last two days, simply to bring the young chicks out. He does not recommend

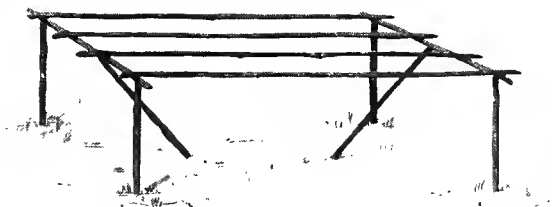


FIG. 102.—ROOSTS FOR TURKEYS.

the eggs being kept in an incubator during the whole period. Turkeys make splendid sitters and mothers, and, as there is no advantage in too early hatching, they usually become broody quite soon enough for our purpose. If the turkeys are roosting in the trees it is an excellent plan to put two or three boxes or empty barrels upon their sides in some out-of-the-way corner, and very often it will be found that the turkey hen, imagining that she has discovered a place of which no one else knows anything, will commence to lay there. At this period it is necessary to observe her very carefully, and to remove the eggs as they are laid, leaving a dummy in the nest. When she has produced about fifteen eggs some may be left there, and it will be seen that she will commence her sitting operations. If desired, she can be allowed to sit in the same place; but, as many of the best breeders prefer to have the birds under control, when she has become thoroughly settled upon the nest, she may be removed at night elsewhere without much fear of breaking her off. That plan is certainly desirable, because otherwise the male is often very apt to disturb her and cause mischief to the eggs. Where turkeys are put upon nests of the kind last referred to, these should be in boxes at least 27 to 30 inches square, and she will be there treated in exactly the same manner as described previously in Chapter XI. It is well to mention that sometimes a turkey hen can be induced to lay twenty to twenty-five eggs. Under these circumstances she may be

given about fifteen, and the remainder placed under a quiet, well-feathered, and good sitting ordinary hen. If that plan is adopted, when the hatching is completed the entire batch may be given to the turkey for rearing, as she is able to brood a much larger number of chicks than she can cover eggs. We must not forget that turkeys are very close sitters, and therefore it is essential to see that they come off the nest every day for feeding. A turkey hen, if allowed, would feed upon the nest, but that is neither good for herself nor for the embryos. If she is carefully handled and removed to an open yard, and there given food, water, and a dust-bath, she will return to her nest reinvigorated for another day's duties. The period of hatching is about twenty-eight days. The advantage of using an incubator for the final stage is that there is no fear of the young chicks being crushed by the mother, as is often found with such heavy birds.

REARING.

When the young birds are hatched they should be left for at least twenty-four hours before they are removed, but it is better that the hen should be well fed at once. Large roomy coops of the ordinary pattern are required for turkeys, and, for the first few days, to these should be added wooden-framed runs about 1 foot deep and covered with netting, because it is generally admitted that turkey chicks are slow in assuming activity. These runs will not be required for more than about ten days, except when ordinary fowls are employed. Under such circumstances the hens must be confined for a longer period. At the end of ten days the turkey hens may be given their liberty, as they will not be likely to lead the chicks astray too far. It is essential, however, that the hen and her brood shall be closed in at night. Coops should be placed on a nice piece of short grass, where they will be sheltered from unfavourable winds, and be about 30 yards apart. They must be moved on to fresh ground every day. In districts where there is plenty of natural shelter this is all that is required in the way of protection. Mr. Gage Harper, who is one of the most successful rearers in East Anglia—a district which is wind-swept during the spring months of the year—follows a plan that can be recommended. He always plants a field in rye grass, and as soon as the row is from 24 to 30 inches in height lanes are cut with a mower in various directions through it, generally north-west to south-east. In these lanes the coops are placed, and, as a result, the young turkeys have all the benefit of fresh ground and of sunshine, but at the same time the wind sweeps completely over them. A further benefit is that the hens will be found to strip the heads of the grass, which the chicks devour greedily. For older birds he frequently has oats planted, and the ears are consumed whilst in a green state in the same manner. The period of cooping is about eight weeks,

when the red usually begins to appear on the heads, and by this time the coops are moved gradually towards the perches or trees, when it is found that both the mother and her brood begin to roost there. Practically, by that time the difficulties of turkey-raising are at an end, for with the appearance of the red upon the heads the birds are much harder than was the case previously. The treatment in summer is comparatively simple, as the birds roost either in the trees or in the house previously described. In some districts where foxes and other enemies abound it is necessary to take special steps to protect the birds. To this end, if the birds are kept in the open, the earth around the trees and under the roosts is thickly strewn with gas-lime and asafetida, the pungent odour of which is generally sufficient to keep marauders from the birds without doing any harm to them. The gas-lime, however, must be renewed as frequently as is necessary, otherwise loss will result.

FEEDING.

Stock turkeys may be fed in the same manner as prescribed for ordinary fowls, but we must not forget that they obtain a large amount of greenstuff and natural food during their foraging expeditions, and that supplied to them should be subsidiary. It is important in the case of the breeders to keep them in good condition, for which purpose full liberty is essential. The food provided may be any of the ordinary grains, but in addition a few peas or beans are very helpful, as they are low in fat and in carbohydrates. It is better to feed whole grain than soft food.

THE GROWING PERIOD.

The young turkeys are first fed on hard-boiled egg chopped fine, with boiled rice and soaked bread, or rice simmered in milk. The rice should be mixed when quite soft with sifted oatmeal, Spratt's meal, or ground oats, until it is crumbly moist. They should be fed five or six times in the day, the first feed to be as soon as possible after daylight, and the last about six o'clock in the evening. When a week or ten days' old gradually change the food, introducing barley-meal or ground oats mixed with middlings, also buckwheat or wheat (the latter should be boiled), and, most important of all, plenty of young onions chopped fine. Any kind of tender green food is useful, but onions are most valuable. Young clover, or lettuce, or dandelion, or nettles can all be used with advantage. As soon as the birds have "shot the red" they may be fed upon green oats, wheat, buckwheat, and barley, varied with boiled wheat dried off with barley-meal. The great requisites for successful turkey-rearing are:—(1) a dry, comfortable house and run; and (2) good and proper feeding. On cold or wet days mix a little seasoning in the soft food, and give every day for the first three months a little chopped meat or Spratt's crissel. Bone-

meal or fresh bones should be mixed with the food, and there should be a plentiful supply of grit. It is necessary to move the coop every day or the ground will become tainted. When the young birds are about a fortnight old, let the hen out of the coop for about an hour a day, which may be gradually extended in time, but do not let her take the chicks among long grass, nor give her too wide a run, or she will tire them out.

A dry summer is most harmful to the turkey-raiser, for then the supply of natural food and of green food is very scanty. Under these conditions a fuller diet is essential, chiefly in the direction of a more plentiful supply of green food. Those who have plenty of woodland will find a hot summer less harmful than where the land is more open, as the cool shade of the trees prevents the growth thereon being burnt up to the same extent. It is frequently noted that at Christmas turkeys run smaller in size than if the summer has been cool and moist. Thus all things have their compensations.

The following hints on rearing are by Mr. W. Willis Harris, author of "How to Breed and Rear Successfully the Turkey," and are of an eminently practical nature:

"The cause of the great mortality amongst turkey chickens—and that is what disheartens so many—is due in ninety-nine cases out of a hundred to their owners neglecting them during the first two months of their chickenhood, and to a want of knowledge of the true habits of the birds.

"The chief things to be remembered in rearing young birds until they are eight or ten weeks old, or twelve if late hatched, may be classified as follows: (1) Climatic, (2) physiological, and (3) sanitary conditions.

"1. The climate should not be of too humid a nature, and a clayey soil should be avoided. Turkeys do best, *ceteris paribus*, when reared upon a soil of a gravelly or sandy nature, as they require an abundance of sharp grit to assist digestion. Clay is not only cold and damp, but if birds be brought up on it sand must be provided and scattered about the rearing-ground in the vicinity of the coops for the young chicks, and after the first year it will also be necessary to supply the adult birds with sharp grit. Until the young birds have 'shot the red' they must be protected from rain and wind, a slight shower or boisterous gale proving fatal, and it is equally necessary to shade them also from direct rays of the sun during very hot weather.

"2. The chicks having very small crops, it is absolutely necessary to feed them very frequently—i.e., every two or three hours from sunrise to sunset. The first meal, after emerging from the shell, should consist of raw eggs beaten up with milk, boiled to a custard, or the eggs boiled hard and either chopped up fine or pressed through a piece of an old wire

blind. This food should be given them for at least a week, and then dandelion, minced up with the egg, and varied with biscuit meal, should form their diet for another fortnight. They also do well upon Indian corn bread, mixed with egg before baking. After three weeks the egg food may be discontinued, and the five meals a day may consist of: (1) Oatmeal porridge, (2) biscuit-meal, (3) maize (cooked the same as hominy), (4) boiled rice, and (5) a mixture of small grain, such as dari, groats, canary, millet, and hemp seed, given for their last meal at night. As the birds grow older they may be fed less frequently, ground oats and middlings taking the place of the other meals, and wheat, barley, oats, and maize substituted for the smaller grain. Dandelion, mustard, lettuce, young nettles, and clivers should be given *ad libitum*, and when the chicks are cooped up with the hen insect food or a substitute must be provided—either Spratt's crissel, Lu'lock's liver, boiled or raw, passed through a sausage machine, or ants' eggs, the *sine quâ non* of successful turkey-rearing being a continual supply of animal food in abundance when the birds are young. Dandelion acts as a prophylactic against liver disease, which young turkeys are more liable to than the chicks of ordinary poultry; nettles keep their blood in order; hemp seed given when the heavy feathers are coming assists their plumage; rice given occasionally prevents or checks diarrhœa; and insect food, being the natural, is therefore the best stimulant they can have. If fed on moist food the first three weeks, they require no water, obtaining sufficient from the dew off the grass if allowed full liberty. Until three months old the poults should not be allowed to perch, but kept bedded down upon straw; and when first allowed to roost it is better to cover the perches—which should be flat, and about 6 or 7 inches wide—with pieces of old sacking stuffed with straw or hay, so as to prevent the heavy cockerels having crooked breasts.

"3. Turkeys, both young and old, require plenty of pure fresh air, and should never be kept in a close building. The coops for the chicks, if shut up at night, must be well ventilated and kept scrupulously clean. Water must always be fresh, clean, and kept in the shade, and should be renewed several times a day."

FATTENING.

Upon arable farms turkeys should be fed out upon the stubbles, as they are splendid foragers, as this means a great reduction of cost for food. Such specimens as are intended for use or sale as stock birds will continue to be fed in the same way as other stock poultry; but if they are to be fatted it is desirable to get them into good heart, which can best be accomplished by putting them on to growing roots or cabbages.

This treatment is continued until about November 1, after which time they are fed as soon as liberated in

the morning with a good feed of soft food, usually consisting of barley and wheat meals. When satisfied they wander off to the fields until feeding-time in the afternoon, when they are provided with all the food they care to eat. About November 20—that is five weeks before Christmas—begins the final stage of the process. The turkeys are put up to fatten in a dry, comfortable shed, which must be large enough for the number of birds to be accommodated. The northern and eastern sides of this shed should be well closed in, but the southern and western sides may be barred or wire-netted, thus affording the inmates plenty of air. Broad perches are used, and must not be more than 3 feet above the ground. These sheds are better if provided with open yards. Food and water are placed in troughs conveniently situated, and away from the perches. When put up to fatten the turkeys are given all the food they will eat. The morning feed consists of barley-meal, wheat-meal, buckwheat-meal, or ground oats. Some farmers who are very particular and have good customers mix the meals with milk, and give milk to drink instead of water, an inexpensive addition if skim milk is used, and one which considerably improves the flesh. Although not much used, there can be no doubt that the addition of a little pure fat, about $\frac{1}{2}$ ounce per diem, to the soft food is highly beneficial, softening the flesh. Cooked potatoes can also be added with advantage. The afternoon feed consists of whole barley, oats, buckwheat, and a little maize, and these are more easily digested if steamed or soaked in hot water. When fully satisfied all food should be removed, the troughs emptied both morning and evening, and washed after the morning meal of soft food. In every case there must be a plentiful supply of coarse grit and sand available to the fowls, and a little slaked lime or old mortar will be an improvement. Without grit the turkeys cannot possibly digest their food properly, and without effective digestion flesh production will never be complete. Turkeys can be crammed by machines, as are fowls, but this process is not necessary.

KILLING AND DRESSING.

The usual method of killing a turkey is to first fasten the legs and wings with soft string, which must be strong enough to bear their weight. By means of that fastening suspend them to a beam head downwards, so that the head will fall about midway on the operator's body. Pass the left arm around the turkey's body, so that its tail will point behind. Take its head in the right hand, with fingers under the throat, and thumb at the base of the skull; now give a sharp, sudden, strong jerk downwards, and a sharp twist upwards and sideways, and death will be instantaneous, though there may be considerable muscular exertion for a time. If it is thought desirable to bleed, it can

be secured by cutting the throat, but this must be done at once. Turkeys can also be killed in the same way as fowls, already described.

Mr. Sapwell thus speaks of killing and dressing in Norfolk: "Norfolk has for many years had a great

be rough-plucked, but not drawn, the feathers left on the back of the wings and on the top of the rump; the wings are then crossed on the turkey's back, and the feathers left form two pads, on which the bird rests on the poulterer's shop-board. The birds should

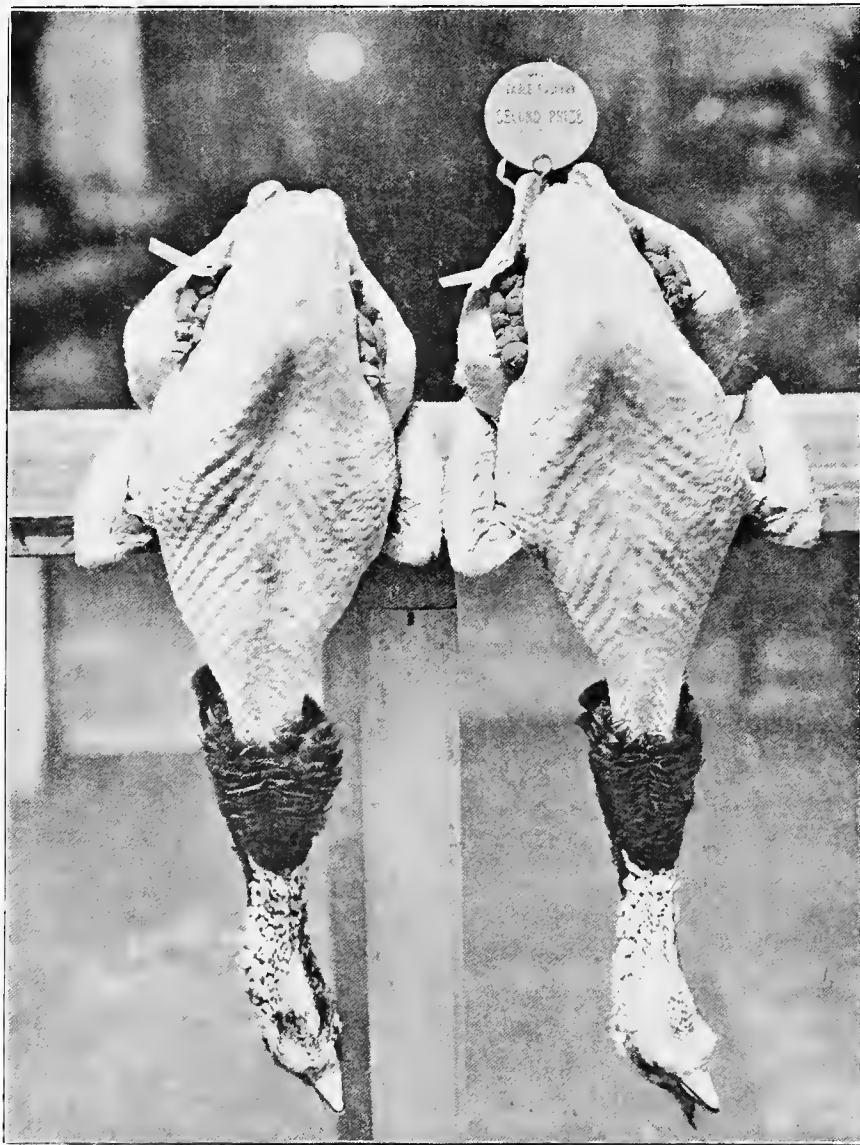


FIG. 103.—TURKEY HENS.

reputation for the quality of the turkeys it produces, and to obtain the highest possible price in the London market it is essential that the birds be dressed in the Norfolk style. The Norfolk style is that the turkey should be killed by having its neck broken; it should

never be killed until after a day's fast, and a handful of barley-meal rubbed over the skin while it is warm adds to the white appearance which is so much desired." Fig. 103 shows the usual method of tying up turkeys for market.

CHAPTER XX.

PRODUCTION AND PRESERVATION OF EGGS.

PRESENT METHODS OF PRODUCTION—IMPROVEMENTS IN EGG PRODUCTION—HOW TO IMPROVE—RECORDING NESTS—
WINTER PRODUCTION—PROFIT ATTAINABLE—SIZE OF EGGS—COLOUR OF SHELLS—PRESERVATION OF EGGS.



THE production of eggs in the United Kingdom is very large, as we have already mentioned,* and is steadily increasing. The three great sources of supply are: (a) Upon general farms; (b) special farms; and (c) by cottagers.

(a) GENERAL FARMS.—As a rule the business is not specialized. Fowls are kept more or less in a haphazard manner, and very little is done to regularize production. Hence we find that supplies are uncertain, more especially in winter. Under an improved system this source is capable of great extension, as the number of fowls kept per acre of cultivated land is small, certainly not more than seven birds to each 10 acres. By the use of portable houses and scattering the fowls about the land they can be fed cheaply, and render great service to the farm in cleaning and manuring the soil.

(b) SPECIAL FARMS.—Where intensive methods are adopted in connection with some form of land cultivation, we believe there is a great future in this branch of poultry-keeping. It, however, necessitates a practical knowledge of and experience in farming or fruit culture to avoid the special dangers involved. These are due to the tainting of the ground where enclosed runs are employed. That the scratching-shed system minimizes that risk we have no doubt, but does not remove it, and the success or failure of special farms will be determined in part by occupying more land than is required for the fowls, and giving each section a rest by cropping.

(c) BY COTTAGERS.—The production is small individually by cottagers, but great in the aggregate, and deserves to be encouraged. In some districts we have found restrictions imposed by farmers and others on the keeping of poultry by cottagers. We have nothing but condemnation for such an action, and believe that every man should have an opportunity

of increasing his income and improving his position in every legitimate way.

IMPROVEMENTS IN EGG PRODUCTION.

Much of the progress which has been made in other departments of live stock and in cultivation has been due to careful selection, using only the most prolific as breeders or food producers for reproductive purposes. It is recognised that in cattle the right method of securing advance is by carefully observing results in the individual, and wherever the exceptional is met with—in early maturity, in flesh development, or in milking properties—by seeking to emphasize the special quality upon the progeny. Some of our most popular races first attained popularity in that way, and the efforts of breeders have been directed towards the maintenance or enhancement of a quality which was exceptional at the outset. In connection with plant life, we have only to consult the catalogues of seedsmen to see that this aim is kept in view. The species or family which gives the greatest amount of return is certain to command the largest sale, and by using the specially prolific it is possible to enhance the returns. What is true in these branches of animal and plant life is equally possible in poultry culture, provided that the same steps are taken, the same efforts put forth. Without observation and systematic breeding it is not to be expected that improvement will take place.

It is an undoubted fact that during the last thirty years considerable progress has been made in the average of eggs produced by our various breeds. We do not mean that exceptional productiveness could not be found previously, for we have only to study earlier publications to find records which proved great prolificacy. They were, however, by no means so general as now, and it seems to be unquestionable that the average number of eggs laid by the common type of hen was a much lower one than is the case to-day.

* See Appendix B.

The type of fowl found, if type it could be called, was heavier than at present; they were more frequent sitters, and generally of a more indolent disposition. The influence of the Mediterranean races has made for increased egg-production, as has also that of the American breeds, and the bringing of artificial methods of hatching and rearing into practical operation have enabled us to dispense with the early sitters necessary under former conditions. Thirty years ago the Leghorn was unknown in this country, or practically so; twenty-five years ago the Plymouth Rock had only been introduced; whilst in the early seventies there was no incubator which was sold at a price within the reach of most poultry-keepers, or could be relied upon to give satisfactory results under ordinary conditions. Sometimes these facts are forgotten by the younger generation of poultry-keepers. When we study the records of egg-production in the fifties, it is to conclude that hens producing more than 100 eggs per annum were few, and more than 120 per annum very rare. Now it is by no means difficult to find records of flocks giving an average of 130 or even 150 per annum, with individuals yielding upwards of 200 in the same period. These facts show that the statements sometimes made that fowls were better and hens more prolific forty or fifty years ago than now are incorrect. That further advance will be made we cannot question. In America, where the study of records is more frequently met with than in Europe, we find that one breeder has secured an average of 176 eggs in twelve months over a flock of 300 hens. This is a startling statement, but we have no reason to doubt it, coming as it does from a reliable source.

Hitherto the increase of egg-production has chiefly been due to the efforts of small breeders rather than to farmers. If what is known as fancy poultry-breeding has rendered no other service than this, it ought to be sufficient to secure forgiveness for many sins of omission and commission. These amateurs, by the very exigencies of their conditions, are compelled to restrict their birds to a very few. When they have the fancy instinct—and there are multitudes of true fanciers who never exhibit, for one is not necessary to the other—they are always striving for the best, and would never think of selling their picked specimens, only disposing of those which fail to reach the standard. Rigid selection is a very important factor of improvement of any race or breed. What would be difficult in the case of a large flock is much more easy with a small number, as individual hens can be picked out and their productiveness noted. Multitudes of breeders can tell us the eggs laid by every hen, and if they are observant, they naturally select for breeding those giving the best results. This is one reason why hens kept in small flocks usually give a higher average of eggs than when massed together in larger numbers. Of course, if time and thought can be given to the

business, it is possible to do the same with the latter. But it requires both time and attention for its accomplishment.

HOW TO IMPROVE.

The system which is common on farms—namely, of running a lot of hens together with a sufficient number of male birds—will never make for improvement, as we cannot thus discriminate between the individual birds. Everyone should breed only from his best, and to do this selection should be made, picking out the hens which are known or believed to have laid the most eggs. One of these lots, which should each be placed in a house by themselves, mated with a well chosen male, will be enough to provide chickens to stock a poultry-yard. From each pen of ten birds we may reasonably anticipate obtaining 300 chickens between January 1 and May 31. Should half prove to be cockerels, and 20 per cent. of the pullets require to be weeded out, there will remain 120 pullets available as layers or breeders. It is only necessary to multiply the number of pens in accordance with our requirements if we desire to breed a greater quantity of pullets than here stated. Frequently by care and good fortune we can secure a couple of hundred pullets from ten hens, but it would be unwise to reckon upon so many, and we prefer to understate rather than overstate the case. The great point in favour of this system is that we breed only from the birds selected for that purpose, and by so doing we are much more likely to attain the object in view. Supposing that we have 100 hens and they average 100 eggs per annum, it is probable that a few are producing 130 each, whilst the many only give 70 or 80. As the latter leave no profit—for it may be reckoned that it takes 80 eggs per annum to pay the cost of rearing and feeding any hen—and as it is just possible that these may give early eggs, we cannot control or influence future progress, because we do not discriminate between one and the other. But if we pick out the hens which lay 130 eggs each, breed only from them, provided they are mated with a sympathetic male bird, we may hope to maintain this average and improve upon it. It is in the way named that we shall increase the average of eggs given by our fowls, for great fecundity is an individual quality rather than a family or racial characteristic. The first thing, therefore, is to induce our farmers to abandon their system of using all the stock as breeders, and to depend upon specially chosen specimens for this work. The doing so may involve a little more trouble and necessitate some personal observation, but no pursuit can be made successful without trouble and thought, certainly not poultry-keeping.

RECORDING NESTS.

In America the question of testing the number of eggs produced by each individual hen has been carried

out by breeders interested in the development of egg-production, and a considerable amount of trouble has been taken to obtain reliable results. The same system is now receiving attention in this country. For the purpose a special nest-box is used, fitted into the house, and so arranged that the moment a hen sits on the nest to lay the door giving admission thereto is closed, and cannot be opened by the hen herself. Thus every hen laying on a certain day is registered, and there can be

careful records are made to insure correctness. But the results warrant the labour involved. The ordinary poultry-keeper need not be discouraged from making an attempt to secure the same information. If the birds are kept in small flocks, and the various specimens are watched to see when they appear to be in laying form, we can to some extent, though of course not with the same certainty, spot those which are really the best layers. The system will not, of course, be so

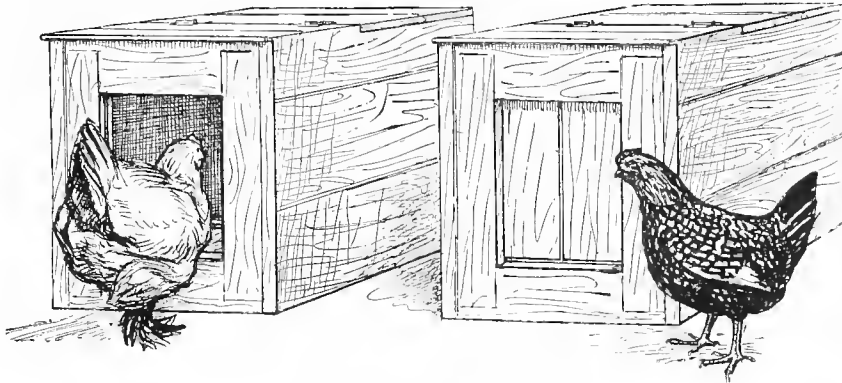


FIG. 104.—RECORDING NEST.

no mistake made as to which hens prove to be the best layers. Two or three forms of nest-box are made (Figs. 104 and 105), in one of which there is a trap-door behind opening when the one into the nest closes, and the hen can thus escape into an open-air run, which is of course preferable to keeping her imprisoned until the attendant comes round. The trap arrangement of the Cairnie nest (Fig. 105) is constructed of light but strong wires, which a hen readily pushes open. The wires are ingeniously fitted, so that when the hen has entered they drop back into a slot, rendering it impossible for the hen to escape from the nest, and also for another bird to enter. Upon the attendant opening the lid at the top of the nest to release the hen, the trap is set automatically, and is ready for the next occupant. A small hook is affixed to the side of each nest for the use of those people who prefer an unobstructed opening, as the hooks hold up the wire front. The trapping arrangement works equally well whether the hook is used or not. The system is more suitable for those who are willing to spend time on experimental work than for the ordinary poultry-keeper, because it is necessary that the poultry-house shall be visited several times during the day, and that very

speedy as that described, but by careful selection we can steadily improve the results; and it cannot be too strongly urged upon every poultry-keeper who has profit in view the importance of giving some time and labour in this direction.

There can be no question that the greatest number of eggs are produced by birds during their first and second years, and therefore it is all the more requisite that we should not keep hens beyond their second year. By the use of marking rings, the ages of the various birds can be at once told, and the idea in the minds of all poultry-keepers should be to half renew their stock every year, getting rid of the older birds in June and July—that is, before they fall into their second moult—which means a great saving in feeding, and also they



FIG. 105.—RECORDING NEST.

will then realize better prices than later on. Further, in many places there is another advantage—namely, that more room can be given to the growing birds. Some years ago we were connected with an experiment to test the relative laying of twelve birds over a period of three years. These were White Leghorns, and in the first twelve months they laid an average of 155 eggs; in the second twelve months the same birds laid an average of 185 eggs; but in the third year they

dropped to just over 100 each, proving that during the first year the bulk of the eggs are produced.

WINTER EGG-PRODUCTION.

In order to obtain the best results in egg-production it is most important that winter laying be increased. Great numbers of the pullets hatched in this country do not begin operations until after Christmas, and thus the best part of the winter egg-trade is altogether missed. We know that the rearing of early pullets involves more trouble, but that trouble is compensated by the results. It ought to be the ideal in the minds of all poultry-keepers to have each individual pullet laying by November 1, which can be accomplished provided that the birds are hatched early enough, and at the same time are reared in a proper manner. It is impossible, in this connection, to lay down any hard and fast rule, because a great deal depends upon the nature of the breed kept, the class of soil, and the method of rearing. Upon heavy soils chickens do not grow so quickly as upon the lighter lands, and the same is true as to the more exposed and colder parts of the country. In respect to the different breeds we can hatch, say Leghorns a month to six weeks later than Wyandottes, and they will commence laying before the Wyandottes. Thus each poultry-keeper must experiment for himself. But if he keeps in view the point to which we have just referred, and hatches to that end, he will very speedily be able to arrive at something like definite conclusions. At the same time we must avoid hatching too early. Very often birds coming out in January or February will lay in the early summer, and may, if the summer be prolonged, drop into moult in the autumn. That result should be avoided. If the first lot of pullets commence to lay in the latter end of September, when eggs are going up in price, and the rest during the month of October, there is no danger of the trouble just referred to. Of course, it need hardly be said that the chickens must be treated in a proper manner, and fed so as to secure early maturity.

There is another advantage which arises from bringing pullets on early—namely, that we should secure sitting hens much sooner than would otherwise be the case; and, further, the following year these pullets will moult earlier and come into lay again sooner than do the later-hatched specimens. The points, therefore, which should be kept in view are early hatching, good housing, proper feeding, and killing off the birds before they come to the period of their second moult.

The question of winter supply is of the greatest importance. The National Poultry Organization Society reports that at its various depots nearly eight eggs are marketed in April for one in November, and in other places the production is much wider. As stated in one of its leaflets, "Traders complain that while they can obtain all the eggs that they require from March to August, during the remaining months they are com-

pelled to rely chiefly upon foreign supplies. As a consequence, they are not disposed to discard those who meet their requirements when these are most difficult of accomplishment. The reasonableness of such a position is unquestionable. It should be the object of all producers to anticipate market demands. So long as the present conditions prevail, it is impossible to fully realize the advantages of the enormous consumption of eggs in this country. As a consequence, eggs command high prices during the winter, but at other seasons, in almost every district, they must be sold at rates which are inadequate. The profitableness of poultry-keeping depends largely upon an equal distribution of the output. Traders and large consumers are willing to pay satisfactory prices to those who can supply them with eggs regularly throughout the year." The result is that prices are lower in the spring than they would otherwise be if the supply were more equalized. The points we should press upon breeders are: (1) Early pullets; (2) young birds; (3) not to break off sitting hens in the summer, as the rest is beneficial; (4) careful selection in breeding; and (5) above all, the choice of winter laying (general purpose) breeds.

PROFIT ATTAINABLE.

Upon the question of cost of egg-production there are many different opinions. Up to the present time observations in this direction are limited, and in many cases not very reliable. Much must necessarily depend upon economy in feeding and in management. Frequently such statistics as are available are either from small poultry-keepers, whose households supply a by no means small portion of the food required, or, on the other hand, from those who feed expensively and are compelled to pay for labour. But we have enough evidence to show that when operations are conducted upon a sufficiently large scale, when the fowls are able to forage for a large part of their food, and grain and meal are purchased in the cheapest markets and fed judiciously, a flock of hens can be maintained at a cost not exceeding 4s. to 5s. each per annum. Whatever expense is incurred beyond the figure named is unnecessary, and it should be the object to bring it within that sum.

To pay such a charge each hen must produce in the twelve months sixty to eighty eggs, according to the season of the year when laid, before profit can be hoped for, and the reward of the poultry-farmer will depend upon the number of eggs secured in addition thereto. If the average production is not more than eighty eggs per annum, whilst there will be no loss, gain will not be realized. If he secures an average of 100 eggs per annum, he should find a margin of 1s. to 1s. 3d. per hen; but if 120 be the average, 2s. to 2s. 6d. per hen will reward his efforts; whereas if he secures an average of 160 eggs, then he may fairly expect a profit of 4s. to 5s. per hen. That should be

the objective of every poultry-keeper, and where attained will yield a satisfactory return for labour and capital, but it will only be when the business is conducted on commercial principles, and by careful selection of laying stock on the lines already laid down.

In this connection we have not counted the cost of the stock. But if the work is properly systematized, the laying hens should practically cost nothing. Upon a farm where 500 laying hens are bred half should be renewed every year, and hence it will be necessary to breed 500 to 600 chickens, of which probably half will be pullets. If bred at the right season, the cockerels can be sold off at 2s. to 2s. 6d. each, and that amount should pay the cost of rearing two birds, so that the pullets at three to four months old will have cost practically nothing, and the additional feeding to bring them to the time of profit will be more than compensated by the sale of the old hens. Much can be done to increase returns by sale of eggs for hatching and of stock birds, and there is scope in every district for a large amount of trade in these directions, more especially by those who give attention to the improvement of economic qualities in their fowls.

SIZE OF EGGS.

It may be true, as many state, that "an egg is an egg" no matter what its size, shape, colour, or age may be. At the same time, however, we have to take into account market requirements, and to consider what is needed in order to obtain the best returns. Upon our markets and in our shops the statement made above must be modified, and we have only to note the prices asked for eggs to see that there is an enormous difference. Some eggs sell at nearly double what is asked for others, and there is a reason for this which, as most readers know, is justifiable. The special point, however, which it is necessary here to emphasize is that size must be taken into account. The ideal state of things would be that all eggs should be sold by weight, but there appears to be a very strong prejudice against the adoption of that system which has yet to be overcome. Taking things as they are, for the best classes of trade it is recognised that an egg which is 10 per cent. below the average in size in many cases is depreciated in value to the extent of 25 per cent., and in some cases it is very difficult to sell the smaller eggs at all.

What has been hitherto accepted as the minimum size for eggs intended for table purposes is 15 pounds per 120—that is, 2 ounces each. We find, however, that in consequence of the attention which has been paid to size on the part of some foreign producers—more notably the French and the Danes—15 pounds is rather small, and we must now aim for 16 pound eggs. That does not mean that eggs of all sizes may be sent making 16 pounds for a total of 120 eggs, but that when fairly sized the average throughout will be

at the rate of 16 pounds per 120. In some cases we have eggs from abroad graded up to 17 and 18 pounds per 120, and on certain markets 17 pound eggs would be distinctly preferred. As a rule, those weighing 1 pound less will be accepted without question. The reason for this predilection on the part of both traders and consumers is that eggs of that size look well upon the table and fit the customers' egg-cups. They do not want for this class of the trade larger eggs, as they would look ugly and top-heavy, whilst the smaller would rattle about in the egg-cups and give the appearance of deficiency perhaps greater than is really the case.

The question arises as to whether anything can be done to improve the size of eggs. Some breeds of poultry naturally lay large eggs, notably the Minorca, Andalusian, Dorking, and Scotch Gray, and in some cases these eggs are, if anything, rather too large for the trade to which reference has already been made. Still, the fault is on the right side, and where these breeds are used pure or as crosses their influence will help considerably in the desired direction. Those classes of poultry which meet market demand most nearly are Campines, Leghorns, Anconas, Houdans, Plymouth Rocks, and Buff Orpingtons. Several of our most prolific breeds of poultry—notably the Hamburg and the Wyandotte—lay eggs which are distinctly small in size, and these eggs are consequently depreciated upon the market. If nothing else can be done, we should be compelled to limit our attention to the first two classes named, because, however great the quantity of eggs produced, it is useless if these are too small for sale upon the market. We know that in all breeds the first eggs laid by pullets are small; but that is greatly emphasized in the case of those races which even during their maturity produce eggs under the average in size.

There is, however, at hand a method of improving the size of eggs, to which we call special attention, as it is possible with every breed to modify considerably the weight of egg, either in a forward or backward direction. The system is a simple one—namely, by selection of the eggs for hatching. It will be easily realized that if, in order to secure early birds—which in itself is often a very important point—we take the eggs just as they come, and these be small, we emphasize that tendency, as we are breeding from the hens which naturally lay the smaller-sized eggs. The point, however, which every poultry-keeper whose object is egg-production should keep before him is to only set the eggs which are of the proper size. Ultimately the results will be much more satisfactory, even if we do not secure our pullets as early, if the eggs are of the right size. It ought to be an axiom with every poultry-keeper never to set either an abnormally large or small egg, unless it is intended to kill the chickens at an early age, when size is of lesser importance. We

do not for a single moment suggest that a large egg means a large bird, because some of the largest races produce distinctly small eggs; but when the produce is intended to be sold for market requirements we must keep in view the point which has been named. A further tendency towards the perpetuation of small-sized eggs is due to the practice, which so many people follow, of hatching from eggs produced by young pullets. This is a mistake, and as far as possible our breeding and laying stock should be descended from hens fully matured—that is, not less than eighteen months old. Further, where there is no objection to crossing, then a very excellent plan is to introduce a dash of Minorca blood, and if that breed is mated with others producing tinted-shelled eggs an advantage will be secured in that there will be retained a measure of colour in the shell.

COLOUR OF SHELLS.

In some home markets the highest price can always be obtained for eggs which have a tinted shell, and the best class of traders find that these eggs are almost constantly inquired for by their customers. In spite of the fact, which is generally acknowledged, that the colour of the shell does not indicate the quality of the egg, and that a white-shelled egg produced under the same conditions is as rich and has an equally nutritive value as the egg having a tinted exterior, the preference indicated above must be taken into account, otherwise—especially during the plentiful season—the same price cannot be obtained in some markets for eggs which are all white as when there is a considerable proportion of tinted shells. Amongst the best class of consumers, where boiled eggs are simply an item on the breakfast-table, there can be no question that a nicely-tinted shelled egg looks better in a silver stand than one which is pure white, and appearance must always be taken into consideration.

The breeds which produce tinted-shelled eggs are without exception sitters, although there are certain breeds that evince the maternal instinct that produce white-shelled eggs. The following list will show the breeds which give tinted shells amongst those commonly kept, and they are placed as far as possible in accordance with the depth of the tint.

Langshans.	Wyandottes.
Cochins.	Brahmas.
Plymouth Rocks.	Faverolles.
Orpingtons.	Coucou de Malines.
Game.	

In addition to these, there are other breeds which are not kept for egg-production, notably the Indian Game and the Malay. We must therefore look, in the first instance, to the above breeds to give us the tinted shells, either by keeping stock pure or by using these breeds for crossing purposes. Of all the varieties of

fowls, there is no doubt that the Langshan produces the most beautifully-tinted egg, which explains why that variety at one time attained such a large measure of popularity.

Unfortunately some of the breeds named above lay eggs which are small in size, but in this connection it must be borne in mind that the public will accept a smaller tinted-shelled egg without complaint than if it had a white shell; and most of the breeds named above produce eggs which do not scale nearly so heavily as several of the white-shelled egg-laying races. Hence it is that frequently crosses are made with a view of increasing the prolificacy, and at the same time securing larger size in eggs. This results in the shells being less highly tinted than would otherwise be the case; but much can be done by careful selection to deepen the colour of the shell—that is, by selecting eggs for hatching which are deeper in tint than usual.

In crossing a white-shelled race with one producing tinted-shelled eggs, it is necessary to depend chiefly upon the females for conserving this characteristic, and we should advise that in such crossing the male only should be selected from the white-shell producing races. One great advantage which all the breeds that produce tinted-shelled eggs have is that they are naturally better winter layers than the white-shelled varieties, due to the fact that they are usually very good sitters and mothers, and obtain a rest during the spring and summer months. There can be no question that one of the chief points which egg-producers in this country have to keep in view is the increase of the winter output, and if combined with this is a greater number of eggs with tinted shells, a dual advantage will be gained. Nearly all the increase in egg-production seen during the last few years has been in the spring and summer months of the year, which has undoubtedly had a tendency to cheapen the prices of eggs. Therefore if a larger number can be produced during the winter months the market would be more regular, and producers would obtain better average prices than is now the case. In striving to increase the total number of eggs, the tendency has undoubtedly been to choose the non-sitting breeds.

PRESERVATION OF EGGS.

With a plentiful supply of eggs at one season of the year and great scarcity at another, we can understand that an idea has been prevalent of securing enhanced profit if eggs can be kept from the time when they are plentiful and cheap, to be sold when they are dear; it is small wonder that the means of making this augmented profit has been diligently sought for. We do not think that the result has been as satisfactory as could have been wished, but it is a fact that enormous numbers of eggs imported from the Continent during the winter season have been preserved, or “pickled,”

as it is called. These too often are far from what we should like to eat, but there are many people who are by no means fastidious in palate. Perhaps they have something of the Chinese taste, for denizens of the Celestial Empire regard eggs as the more dainty when they are at least ten months old. That, happily, is not the case with Western nations, who, as a rule, prefer to have them as fresh as possible. Though we think that the methods adopted for preservation of eggs are by no means as successful as could have been wished, yet there are ways in which they can be kept for a considerable period, and be good for culinary purposes, and not objectionable to many palates for eating in the ordinary way.

PRINCIPLES OF PRESERVATION.

To secure effective preservation, the yolk should be kept suspended in the centre of the albumen, otherwise decomposition will be rapid when it comes into freer contact with air; evaporation of moisture germs should be excluded, and eggs be kept in a cool place. The first-named is the most difficult, where eggs are not in a position to be turned. A further point is that eggs appear to keep longer if they are infertile than when the germ is active. We have only once seen it suggested that infertile eggs might keep much better than those which have the germ of life within them, but a little thought will show that this may be a most important matter. The idea was suggested to our mind by remembering the fact that infertile eggs never go rotten when set upon by hens. They dry up and become fusty, but it is only the fertile egg that becomes actually rotten. In the former there is no germ of life to die and become putrid. In the latter it is death of the living organism which causes rottenness. The germ must have actual life within it, for the life cannot be introduced after the egg has been laid, and the presence of life gives all elements required for putridity. We do not feel that there need be any doubt that the preservation of eggs may depend greatly upon whether they are fertile or infertile. As already explained, the former have within them the germs of rottenness and the latter have not. Therefore we should strongly advise those who intend putting eggs down for winter use to use only those which are infertile. Though we cannot go so far as to lay down as a fixed rule that for which we have been here contending, there is so much of reason and of probability in it that we feel quite justified in going as far as we have done. There can in no case be any advantage in preserving fertile eggs, for they can never be used for hatching, and there is little or no difficulty in arranging that the eggs be infertile.

The question is often asked as to who should preserve the eggs. On the Continent it is customary for this work to be carried out on a large scale by traders, but under such conditions the best results cannot be

obtained, as the eggs must have lost quality when they are treated. The fresher the egg when preserved the better it will come out, all other things being equal. Hence we advocate that producers should keep their own eggs, or that they be kept as near the point of production as possible, provided that a cool place can be provided, and they will then reap the advantage of enhanced returns. Under these conditions native preserved eggs should be superior to those received from abroad.

METHODS OF PRESERVATION.

The following are the methods known to us at the present time:

1. Lime Water.
2. Salt.
3. Waterglass (Silicate of Soda).
4. Glycerine.
5. Fat or Butter.
6. Cold Storage.
7. Turning.

LIME WATER.

The method most commonly used and which was first patented in this country a hundred years ago is as follows: The eggs are placed in tubs or large vats as soon as possible after they are obtained from the poultry-keepers. Some vats hold hundreds of dozens, and are kept by dealers who buy them in from the fowl-owners. A preparation of lime and water is made by mixing 20 gallons of water with 4 gallons of fine slaked lime, to which a gallon of salt is added. When the water appears to have taken into solution as much lime as it is capable of holding, which will be in six or seven days, it is poured over the eggs so as to completely cover them, and it is usual not to pack the eggs quite up to the top of the vat, so that there may be 2 or 3 inches of water above the top layer. It is, however, found necessary to add from time to time a little more lime, or by keeping a cloth of lime on top touching the water, so that, as the lime in solution is absorbed, or loses its effect, more can be taken up. Unless this is done the preservation will not be successful, for water alone will not be sufficient to keep eggs in a fresh state. The same end can be secured by throwing a handful of fine lime into the vat every few days, but it is a rougher method, which may lead to trouble if not very carefully done. The great object, therefore, in preserving eggs by this method is to supply enough lime for the preservation, and no more. When eggs are taken out of pickle, they are carefully wiped and packed in straw. Anyone can discern limed eggs by the roughness of shell. They have not that bloom by which a fresh egg can always be known, but there are not ten persons in every thousand who know anything about the bloom.

SALT.

Eggs can be preserved in dry salt, and so treated keep good for a very long time. Salt effectually keeps away the air, which is a most desirable thing with all eggs to be kept for long, and prevents mildew or the growth of fungi. There is a slight taste given to the egg when salt is used, but this is not at all objectionable. The only disadvantage which we know from the use of salt as a preservative is that it absorbs a portion of the moisture in the egg. Thus it is that eggs so preserved are found to have their contents loose. For table use this would at once raise a prejudice, and it would be impossible to market such eggs, as it is generally supposed all that rattle inside are stale. But there can be no objection of this kind when they are only to be used for cooking purposes.

WATERGLASS.

A 10 per cent. solution of silicate of soda is now one of the most popular methods of egg-preservation. A concentrated solution can be purchased of chemists, and to this should be added five or ten times its bulk of pure water. It will mix better if the water is heated, but the solution must be allowed to stand until quite cold before it is used. The eggs may be dipped into the liquid and dried off, but the preferable method is to keep them therein until they are required. When taken out they are sticky, and before packing should be wiped or dried off. Experiments in America with a 3 per cent. solution have proved as satisfactory as when 10 per cent. of the waterglass was employed.

GLYCERINE.

In Canada glycerine is largely used. The shells are coated with the liquid and dried off, thus closing the pores and preventing evaporation of moisture. Much of the result, however, depends upon the temperature at which the eggs are kept.

FAT OR BUTTER.

In this case the method is practically the same. "Buttered" eggs are sold in many districts during the winter, and where they are not to be kept for a long period the system can be recommended. The fat or butter must be perfectly fresh and sweet, otherwise the contents will be tainted, and care should be taken to insure that the shells are entirely coated.

COLD STORAGE.

Eggs can be kept in a cool place for a considerable period without any special preservative, and we have known eggs so kept quite good for cooking at the end of six months. In America the system has been

developed to an enormous extent, and large egg-stores erected, but not with altogether satisfactory results. The system depends most of all upon the place, and it is not applicable to all. There can be no question that if anyone has an ice-chamber, some portion of which can be given up to keeping eggs, they do not need any other preservative, and we believe that chilled eggs retain more of their original qualities than those kept by means of any of the preparations which have already been described. The reason for this is not far to seek. When an egg is chilled everything is held in suspension, and no process of change or decay goes on. The disadvantage of this system is that if the eggs are not properly defrozen they crack, and it is often difficult to avoid their cracking in any case. They should be very gradually brought to their normal condition, first by placing them in an atmosphere but very few degrees warmer than the cool chamber, which should be kept at 34° F., and, after giving two or three hours there, gradually placing in a warmer air until the ordinary temperature has been reached. Under this system it is desirable—though the plan is not customary—to remove the eggs from their cases. Eggs preserved by cold storage must be used speedily after they are removed from the cool chamber, as they deteriorate very rapidly indeed, which explains why the system has not extended. No other products must be kept in the same room.

TURNING.

There are many poultry-keepers who only wish to preserve their surplus eggs for a few weeks, and in this case it is not necessary to use any preservative, or even to chill them. All that is requisite is to have a cool cellar, larder, or closet, fitted with perforated shelves. The eggs should be placed broad end downwards on these shelves; but they may with advantage be turned about twice a week, keeping them, however, almost all of the time with the broad end downwards. The reason for this is that when so kept the air-space does not increase in size, and the eggs seem to keep better. It is a very good plan to arrange eggs in uniform rows from front to back, so that those laid first can be used first. We once knew a poultry-keeper who had large stoneware jars for keeping his eggs in. These would each contain about a hundred, and the eggs were placed in regularly every day as they were laid; as soon as one was full, it was emptied into another jar, so that the first laid were in that case at the top. This gentleman never appeared to take any special care in the matter, and yet his eggs were wonderfully fresh when three or four months old; but he had a very cool cellar where the jars were kept, and that was the explanation. Without a cool place it could not have been accomplished in such a free-and-easy fashion.

GENERAL SUGGESTIONS.

The following suggestions are quoted from a leaflet* issued by the Board of Agriculture and Fisheries:

"Eggs for preservation should be treated as soon as possible after they are laid, but not until they have been cooled. It is recognised that an egg twenty-four hours old is superior to, and has greater food value than, one a week old. Consequently, if when placed in the preserving medium the egg has depreciated to this extent, the final result cannot be as satisfactory as under the former conditions. It is therefore desirable that preservation should be as near to the point of production as possible.

"Eggs should not be treated in a warm place, and where lime-water or waterglass is used the preparation should be quite cold before the eggs are placed in the solution.

"Eggs from hens fed chiefly upon grain, and with full liberty, are likely to keep better than those laid by fowls in confined runs.

"The general experience has been that infertile eggs

* Leaflet No. 83, Board of Agriculture, 4, Whitehall Place, S W.

keep in good condition longer than those which contain a living germ. Probably this is less apparent when eggs are preserved at a low temperature.

"When eggs are preserved in waterglass or lime-water the containing vessels should be stored in a cool place, at a temperature not less than 33° F., nor more than 45° F. A cool, sweet cellar is excellent for this purpose. Exposure to a higher temperature, even for a few hours, will cause deterioration in spite of the preservative.

"Preserved eggs should be carefully tested by light before they are sold. For this purpose a well-constructed candling lamp is to be preferred; but a piece of black cardbeard, 8 inches square, with an oval hole in the centre rather smaller than an ordinary egg, can be used. Each egg is placed against the hole, and held between a strong light and the eye, so that the condition of the contents can be observed. All dark eggs or those showing spots or black shadows should be rejected.

"The best months for preserving are March, April, May, and June. It has been found in many cases that summer eggs do not keep nearly so well as those laid before the hot days."

CHAPTER XXI.

MARKETING THE PRODUCE.

WHENCE EGGS ARE RECEIVED—THE EGG TRADE—VALUE OF EGGS AS FOOD—QUALITIES OF EGGS—FLAVOURING EGGS—
AGE OF EGGS—RAPID MARKETING ESSENTIAL—METHODS OF MARKETING—GRADING EGGS—PACKING—IMPROVING
THE EGG TRADE—TABLE POULTRY—MARKETING CHICKENS—SALESMEN—RAILWAY RATES.



STATISTICS are given in the Appendix showing the great increase of egg imports during the last generation, and it is interesting to learn whence comes all the mass of food represented by these figures, and how it is consumed. There seems no limit to the demands of the English stomach. Since the St. Gothard tunnel was opened from Switzerland to Italy the traffic has been something astounding. The competition of routes led to a great reduction of rates, and eggs are brought from Northern Italy to London for much less than used to be charged from Northern France. Whilst the railways in the latter country were asleep others were awake, with the result that the French trade suffered. A new outlet has been found for the farmers and cottagers of Northern Italy, and tons of eggs arrive daily in England brought by the St. Gothard route. Previous to the opening of the tunnel, the imports, though greater every year, had not risen by leaps and bounds, and those who were interested in the question began to think that this slower increase was due to the larger number of fowls kept at home. That may have been true in some measure, but not entirely so, for as soon as there is a more abundant supply, the whole of it is absorbed without any great reduction in price or glut in the market. Of late there have been vast imports from Russia. That there has been a great increase in the home production of eggs no one can deny, and the signs are that it will still more increase. If the home produce of eggs could be doubled at once, there would even then be plenty of room for all the imports that now come. As the increase of people in all great centres of population continues, so will that of demand for eggs, from the recognition of their value as an article of diet, and we need a very large addition to imports or home production every year.

THE EGG TRADE.

The demand for eggs is a varied one. First, there is that for table purposes, which is ever increasing, the

consumption of eggs growing year by year. They have come to be more and more regarded as a valuable article of food, containing as they do all the elements necessary to sustain life and nourish growth. Eggs used for domestic purposes may be divided again. There are (1) the new-laid eggs, and (2) those for poaching and frying, and in our great cities, especially London, the prices which these realize are very high. For guaranteed fresh eggs the retail prices range from 1s. 4d. to 2s. 6d. per dozen, according to the season of the year. These eggs, which are either English or French, are from one day to a week in age, and must be perfectly fresh, without the slightest sign of taint. In order to secure so important a consideration various means have been devised. As the best prices are paid, purchasers naturally insist upon receiving really fresh eggs. These best qualities are graded into two qualities—viz., the “new-laid” (one to three days old), and “breakfast” eggs. In some cases there is a third grade, called “fresh.” Next to these stand cooking eggs, which are generally from Ireland and Denmark. These are not quite equal in flavour to new-laid, and, whilst neither stale nor tainted, have not that fresh look which the others show. They are eaten by millions, but could not be put on the tables of those who know what a really fresh egg should be. In many houses these are used principally for cooking, and the retail price ranges from 1s. to 1s. 6d. per dozen. And, finally, there are the box eggs, themselves of various grades, which are used for cakes and pastry, and eaten by our poorer classes when they indulge in the luxury of an egg, but would not be accepted as fit for cooking, much less for eating, by many. These can at all seasons be bought at from 6d. to 1s. per dozen. A considerable portion of the commoner qualities of box eggs are used for manufacturing purposes. Thousands of boxes are taken by leather-dressers, and there are several other trades that consume vast quantities of the eggs which figure in import returns. The prices of this class of eggs range from 5s. to 8s. per long hundred.

VALUE OF EGGS AS FOOD.

It is generally accepted that weight for weight an egg contains more nutriment than any other kind of food. There is no bone, no gristle, no great proportion of water, and the only portions which are not edible—the shell and the outer membrane—are a very small percentage of the whole. Thus there is the very modicum of waste or refuse. Eggs, as a rule, average eight to the pound, and a dozen eggs, even though they cost 2s., are cheaper as an article of diet than 1½ pounds of beefsteak. The two will cost alike, but in point of real nutriment we believe eggs have the advantage. Eggs can be served in scores of different ways, and can be presented in the most palatable forms. They enter into the composition of innumerable dishes, are relished equally by the invalid and the healthy; together with milk they should form the principal diet of children and are, in brief, one of the most valuable of our foods. It is true they do not suit all stomachs. Those who are known as bilious subjects dare not eat many eggs; but apart from such people, there are few to whom a new-laid egg does not appeal.

QUALITIES OF EGGS.

It is often supposed that the more deeply tinted the shell the richer the egg. That question is discussed in the previous chapter. Be that as it may, it is a certain fact that some eggs are much richer than others, and that several varieties of fowls lay better eggs than others. Common observation will show this to be true. Eggs are selected by their size and smoothness of shell when all are alike in point of freshness, whereas the real test ought to be the flavour and quality of their contents. To many people an egg is simply an egg, and nothing more; but there are eggs *and* eggs. There is really as much difference between the flavour of a well-fed Langshan or Game egg and that from a Black Spanish hen as between the meat coming from these respective birds. The meat on the former is rich and well flavoured, that on the latter is dry and insipid; and the eggs are pretty much the same. If some of our scientists would go thoroughly into the subject, and tell us the quality of eggs produced by each variety of our domestic fowls, they would render an incalculable service to the community at large. Doctors would then be able to discriminate between one and the other, and, in ordering their patients these invaluable comestibles, could tell which to select. A bilious subject who dare not eat a Cochin or Game egg might partake of a Minorca or a Spanish egg with less risk. Eggs can be influenced by the food consumed, and the whole question is full of possibilities. All eggs are not alike, they each have distinct qualities, and it should be the object of poultry-keepers to encourage the buying of eggs by the breeds producing them, for in that way will the best qualities obtain top prices. Perhaps some day

we shall see eggs in shops labelled according to their breed as well as their freshness.

FLAVOURING EGGS.

A suggestion has been made that much might be done in the way of improving the flavour of eggs. We know that food must have a very great influence on the produce, and every poultry-keeper can realize the difference between the production of his well-fed hens and those which come from badly-fed fowls. But this suggestion goes further. It is said that a new industry might be created in the raising of poultry and domestic animals upon certain kinds of food which will impart to their flesh new and palatable flavours. It is well known, for instance, that the exquisite flavour of the Canvasback duck is due to the wild celery it feeds upon in the southern marshes of North America, and the delicious Congo chickens owe their superior excellence to the pineapples they eat. The grouse of the Far West plains is aromatic with the wild sage, wild ducks and other sea-fowl have a fishy flavour, and the fish fed to swine may almost be said to be eaten over again by the consumer of their pork. Milk is especially affected by whatever is eaten, as every farmer can testify whose cows give bitter milk when they eat the leaves of the burdock, etc.

Though this is from an American source, the suggestion is not to be dismissed as a piece of Western exaggeration and imagination, for it has sound theory at the back of it. The quality of both eggs and fowls is affected by the conditions under which they are kept and the soil upon which they are placed, as well as the food they eat. Thus, we find that the fowls of some districts are much better than those of others. Therefore it is quite possible to feed for flavour, though whether it is practicable from a commercial point of view must be left to the determination of practical experience. Of course, whatever food is used would have to be such as would not injure the fowls, or the harm done would more than counteract the gain secured. The limitations of this country do not permit of the same scope as in others, but as heather-fed honey is so much superior to that produced by bees under cultivation, and as mountain mutton is so much richer and finer in flavour than that from fields and pastures, so there must be eggs and poultry which are the best of their kind because of the places where they are produced.

AGE OF EGGS.

The age of eggs can be told by their density, which decreases as they get older. Suppose that 4 ounces of common salt is dissolved in 1½ pints of water: if a new-laid egg be put into this liquid it will sink to the bottom; an egg one day old will not go quite to the bottom; an egg three days old will be suspended in the liquid; beyond that age it will rise to the surface, and the older it is the more it will rise in the solution.

A simple method, known in the trade under the name of "candling," is determined by the size of the air-space, which in a perfectly fresh egg is very small, not larger than a sixpenny-piece. As the egg loses part of its contents by evaporation of moisture every day after it is laid, the air-space increases in size, until a month afterwards it may be that it occupies one-eighth of the

they have to travel only a tithe the distance, are marketed so rapidly as three days after being laid, whilst the greater proportion are from a week to a fortnight old ere they reach the consumer.

METHODS OF MARKETING.

Hitherto the method prevailing in this country, except in residential districts or near to the great manufacturing centres, where producers are able to dispose of their produce almost at their own doors, has been that farmers and other poultry-keepers have brought their supplies into market once a week, there meeting buyers who purchased them at their own price. This system practically gives the trade into the hands of foreigners, for home eggs are generally at least a week old at that time, and when they reach the retailers and consumers they are older than the French, and as old as Danish or even Italian. Hence the advantage of nearness to markets is largely sacrificed. Eggs are placed upon our markets from foreign countries as follows: French, in four to six days; Danish, in seven to nine days; Italian, in eleven days; Hungarian, in fourteen to twenty days; Russian, in twenty-eight to forty days. The price of home produce is to a large extent determined by the age. If British eggs are eleven days old when marketed, the Italian price will have a great influence in fixing the returns obtained.

The Danes have built up their enormous trade in eggs by adopting a system of combination among producers for marketing. In that country, according to the latest reports, there are nearly 400 village societies with about 25,000 members. These societies are co-operative, and it is not too much to say that the remarkable growth of the Danish egg trade is largely due to the expedition in marketing resultant from the organization of the trade. As an example of the benefit obtained, there are many villages and small country towns in this country where eggs are sold at a less price during the spring months of the year than they realize in Denmark. And frequently Danish eggs are higher priced in London and other great centres of population than home supplies, owing to the fact that they are fresher, better graded, and more regular than native production. So long, therefore, as we are content to follow the old lines will we be beaten by foreign produce. British and Irish eggs are the finest in the world for quality when new-laid, but all the additional value is lost unless they are marketed rapidly. Those who suffer by the present system are the producers, and they must take steps to remedy the present condition of affairs.

Several colonial and foreign Governments take active steps to find markets for the produce of their respective countries, and in some cases not merely promote the formation of co-operative societies on Danish lines, and disseminate information which may be of service in

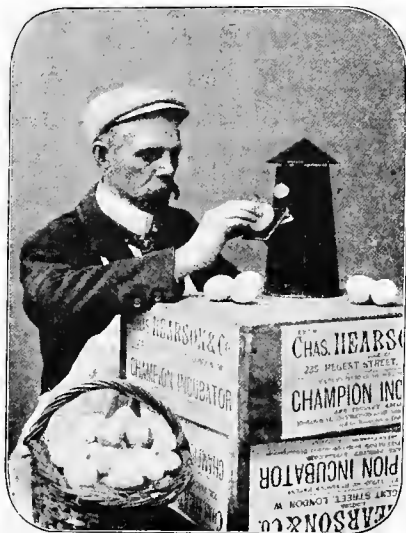


FIG. 106.—CANDLING EGGS.

whole. If the egg is held between the eye and a light, the size of the air-space can be easily discerned. But there are further points to be regarded in making this test—namely, that the egg must be clear and bright, and there should be no trace of dark yolk or spots, nor should the chalazæ or ligaments be ruptured or broken. Fig. 106 shows a useful form of candling lamp.

RAPID MARKETING ESSENTIAL.

The first consideration in marketing eggs is that they shall be placed on the consumer's table as speedily as possible, as they rapidly begin to deteriorate. This is a matter too often forgotten, and in many egg-producing districts they are only collected once a week. When the producers themselves bring their eggs to market this will probably be the case always, as it is now in Britain and Ireland. But the better system is that adopted in France and Denmark, where egg-dealers and egg societies send men round daily, or every other day, by which means they secure the eggs when perfectly fresh. It is possible for an egg laid in North-Eastern France to be on the consumer's table in London within four days. This regularity and systematic collection accounts for the favour in which certain brands of French eggs are held and the high prices they obtain. Few English eggs, even though

securing more advantageous markets, but assist in obtaining new outlets. That, however, is not the policy adopted heretofore in the United Kingdom, as all questions of sale are left to individual enterprise. To meet the growing competition, and to promote the adoption of better methods, the National Poultry Organization Society, whose headquarters are 12, Hanover Square, London, W., was established in 1898. We quote the following from one of its leaflets :

"The National Poultry Organization Society was formed in 1898 for the purpose of encouraging the poultry industry in this country, and of establishing in Great Britain a system, on strictly business lines, by which farmers and others may market their poultry in accordance with modern requirements, and thus, by uniform system and method, and in compliance with the conditions of the trade, obtain adequate returns in competition with the growing imports from abroad.

"The method adopted consists in the formation, wherever the conditions are favourable, of collecting depots, by means of which the produce is rapidly marketed in bulk. These depots are registered co-operative societies, formed of members who supply the eggs and poultry, and amongst whom the profits are divided. These depots are strictly business concerns, conducted upon commercial principles. Eight shareholders are required to secure registration, but may be increased to as many hundreds.

"Depots are established at the most convenient place in any district, whence the produce is forwarded to the great centres of population. Such depots are controlled by the local society, subject to regulations adopted by the parent society, and are members of a federation of depots which directs the marketing of produce, bringing the local societies into direct communication with the retail trade.

"Each supplying member of a depot is provided with a small number stamp, with which all eggs are marked, and bad or stale eggs can thus be traced.

"Eggs are delivered to the local depot by the producer, or collected by the depot from him at least three times per week, so that freshness can be guaranteed.

"At the depot every egg is tested (1) for freshness, (2) for quality. This test is the basis of the system, insuring first-class produce to the customer.

"Such eggs as pass this test are branded with the registered trade-mark of the society. They occupy a place on the market held by no other eggs. Private marks also denote depot and date of despatch. Rose-brand eggs are now becoming known as the finest produced.

"The eggs are immediately graded, packed, and despatched to selected retailers in London and other great centres of population, and thus can be in the hands of consumers within twenty-four hours.

"The results of the adoption of this system, apart from any profits made by the depots, has been to

improve the quality of the eggs and poultry forwarded from the respective districts, due to more rapid and efficient marketing, and to greatly enhance the returns obtained by producers. In many cases this increase has equalled 30 to 40 per cent. above the prices obtained formerly.

"Local societies can help their members greatly by buying appliances, foods, etc., wholesale, and thus securing the best returns, and by disseminating information. The parent society assists the local members to obtain good stock on the most advantageous terms, and protects the interests of its members and depots."

In Ireland very valuable work in the same direction has been carried out by the Irish Agricultural Organization Society, which, established by Sir Horace Plunkett, has done, and is doing, so much for the regeneration of the Green Isle. The result is that Irish eggs are regaining the position in Britain which they had lost, owing to improvement in quality and a more satisfactory system of packing. It is not too much to say that throughout the United Kingdom the adoption of co-operative methods of marketing would place the best trade entirely in the hands of home producers, who would reap their reward in enhanced returns. Distance may be shortened by more expeditious transit, but cannot be annihilated, and with perishable products it is important that they be consumed as near to the point of production as possible. French and Danish eggs ought always to be second to our own supplies. If they are not, the fault is clearly our own.

GRADING EGGS.

A direction in which we do not pay sufficient attention is the care in finishing our work. Therein many other countries excel. These remarks apply to both grading and packing, though we are glad to say a distinct improvement has been manifest of late. By grading is meant the sorting of eggs, so that all packed in one box may be of the same size. Abnormally large and very small eggs should be consumed locally. A big egg will dwarf all others in the case, whilst a small egg spoils the appearance of an entire box, and depreciates its value. Further, when eggs are graded they travel better than if they are of mixed sizes. In fact, it is essential for safe carriage where straw or wood-wool is employed. We are, however, looking at the question entirely in the interests of producers, who must recognise that 15 pound eggs—that is, 1½ pounds per dozen—or, better still, 16 pound eggs, will command a much better price relatively than those weighing 13 pounds or 14 pounds per long hundred (120). And the better price will only be secured if grading is adopted. We have not yet arrived at the point when eggs are sold by weight, which would be the preferable plan.

In France a sorting-board is adopted, in which are three perforations, shaped like an egg, varying to fit

different sized eggs—say seven to nine to the pound. By the use of such a board it is easy to grade the eggs, fitting each to the hole it is nearest in size. Machines are employed in large establishments in which, by means of bars across a sloping table, the eggs grade automatically as they roll down. But these are too expensive for ordinary use. A small sizing-board can easily be made 6 inches wide and 18 inches long, forming a gentle slope down which the eggs will roll. Four cross-bars are fixed at distances of 4 or 6 inches, the first (upper) sufficiently large to stop all eggs weighing $2\frac{1}{2}$ ounces and upwards; the second, $2\frac{1}{2}$ ounce eggs; the third, 2 ounce eggs; and the fourth, $1\frac{1}{2}$ ounce eggs. By this means sorting is very rapid. The board should have sides to prevent the eggs rolling off. But the quickest way is by hand and eye, as in Denmark and Ireland. The operator takes one egg of the size required, holding it in his left hand, and passes each of the lot by the grade egg, placing larger or smaller in baskets prepared to receive them. So skilful are graders in Denmark that they are able to sort the eggs without being more than a couple of ounces out in the great hundred. And this system can be easily learnt by anyone quick in hand and eye.

PACKING.

The methods of packing eggs vary greatly. Happily, the large square Irish cases are going rapidly out of use. All foreign, and now the best Irish eggs, are packed in the long wooden cases, holding 1,440 (twelve

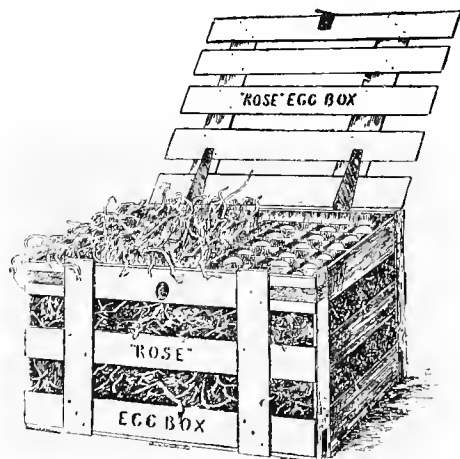


FIG. 107.—“ROSE” EGG-BOX.

long hundreds), and as they have a double partition in the centre, any retailer desiring to buy 720 secures half a case without need for repacking, the box being sawn in two. There can be no question that the latter are the best form for longer distances, as there is no trouble with empties, for the boxes are not returnable.

Many foreign eggs are now packed in wood-wool, and if of the right kind, where straw is scarce, it is an excellent substitute, though not so good. It is remarkable how safely the contents of these cases travel, due to the excellent grading and packing.

Where eggs are sent short distances, and especially if forwarded direct to retailers, they are often packed in large baskets holding about 1,200 or less. But there are now several forms of egg-boxes which are simple



FIG. 108.—Pocock Egg-Box.

and convenient. These boxes have been greatly improved of late. Fig. 107 shows a form which is coming largely into use, called the “Rose” egg-box. It is fitted with square sections, and has wood-wool between the layers. Renewals of fittings and wood-wool are very inexpensive, and it is light and easily handled. The contents can be rapidly unpacked. The Dairy Outfit Co., of King’s Cross, London, make a series of excellent boxes (Fig. 108) with felt layers,



FIG. 109.—SAFETY EGG-Box.

which carry the contents most securely, and are very largely used. In these each egg lies in a felt bed. The Dairy Supply Co., of Bloomsbury, London, also make a very good box for this purpose (Fig. 109). Fig. 110 shows a new form, introduced by Robinson’s Patents, Ltd., of Goswell Road, London, in which all layers of felt or wood-wool are dispensed with, the cardboard sections holding the eggs securely. All these boxes are made for use repeatedly.

In the non-returnable commercial boxes, if we may so term them, the eggs are packed between layers of straw or wood-wool sufficiently thick to keep each row separate. The eggs themselves must be laid close to prevent their rolling about, or breakages will certainly occur. And the box must be full, so that when it is nailed or screwed down it will be firm and compact.

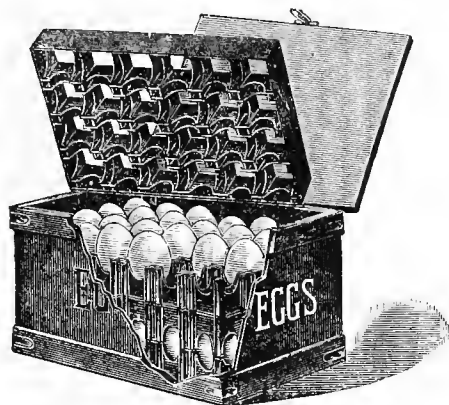


FIG. 110.—ANTI-SMASH EGG-BOX.

One most important matter is that the packing shall be clean and sweet. Eggs are very susceptible to external influences, and if they are packed in dirty or fusty straw they will assuredly be affected thereby. Inattention to this matter, and the sending out of dirty eggs, due to want of clean straw in the nests, will injure any eggs in the eyes of consumers.

IMPROVING THE EGG TRADE.

There are several points which it is desirable to emphasize in connection with the egg trade, and we ask the attention of all who are interested in it.

First, we require more eggs in winter, as referred to in the last chapter. To accomplish this we need early hatching, so as to bring pullets and hens into profit by November 1; good housing and feeding; and the keeping of young birds—that is, not more than twenty-seven months. Every egg laid in winter will probably reduce one in the spring and summer, when they are much cheaper. Thus prices will be equalized.

Second, larger size and greater evenness. The former will result from selection, the latter by sorting.

Third, clean nests, in order that the eggs themselves may be clean. A dirty egg should never be sent to market, for not only does it lose caste in appearance, but it will not keep so long as one with a clean shell. It is better to wash eggs than market them dirty; but washing takes the bloom off the shell, and the eggs soon lose condition.

Fourth, better packing is required. The boxes should carry the eggs safely, but, at the same time, unless the packing material is sweet and clean, the

eggs will be tainted ere they reach their destination. Few articles of food are more susceptible than an egg, and yet the fact is seldom realized.

Fifth, there must be speedy marketing and no holding. Rapidity of marketing has already been dealt with, and we simply call attention to it again. But in some parts of the country in the autumn there is a very bad custom of keeping eggs several weeks to obtain a better price. With a perishable product this is a foolish thing to do, as it destroys confidence, and unless sold as stale eggs, which is seldom the case, it is defrauding the purchaser. The true as well as the honest policy is to sell an egg for what it really is.

Sixth, we need to get out of old ruts. By opening out new connections we can obtain better prices. Grumbling never accomplishes anything. It is those who act that succeed.

TABLE POULTRY.

In Chapter XVI. observations are made upon the marketing of table poultry, but we desire to deal now with the general question as it applies to those who do not fatten largely. One of the objects of the National Poultry Organization Society is to promote the establishment of fattening centres, if possible upon a co-operative basis, in districts where these do not exist, and thus combine the producers so that they may obtain enhanced returns. But to do so is a slower process than is the improvement of the egg trade. In considering the sale of chickens, especially of the better qualities, it is important to remember that the trade varies considerably. Even in London, where the highest prices are realizable, the trade of poulterers differs in accordance with their position. Much higher prices are obtainable in the West End and a few suburban districts than elsewhere, and supplies must be graded in accordance with the requirements of retailers. At a few provincial centres good prices can be obtained; but it is not too much to say that first or even second quality birds will not at present sell remuneratively in the greater part of the country. Hence it is found on the one hand that fatters send their best specimens to London, whilst even provincial poulterers, when they require such birds, order them through the Metropolitan markets. With eggs our object should be to get into direct touch with retailers without any intermediaries, in order to avoid unnecessary profits and to insure rapidity of transit. But in respect to chickens and ducklings, it is better to send supplies to salesmen in London, as they are able to grade the fowls in accordance with the requirements of poulterers, and can thus obtain higher returns than if sent direct to the trader. The plan here suggested is found satisfactory by fatters of chickens in Sussex and West Kent, and the duckers in Bucks and Beds. In provincial markets, and especially for lower grade birds, selling direct to the traders is to be re-

commended; but their trade is not for high-class specimens.

MARKETS FOR CHICKENS.

A most important point, however, is, How can the chickens raised in districts where fattening establishments do not exist be marketed? When lean birds are selling in Sussex at 2s. 9d. to 3s. 6d. each they are often to be purchased in other districts at from 1s. 6d. to 2s. 6d. each. Ultimately, we may hope to find fattening extended greatly, and the work of finishing off completed where the birds are reared. But in the meantime our object should be to bring fatters into touch with breeders.

It will be interesting in this connection to see what is done abroad, and the country which probably most nearly resembles our own is Belgium. It is a small country, with a dense population, and the observations made there should be of service in our own land. In one part of that country there are vast quantities of breeders of poultry, and by reason of local conditions they do not attempt to fatten, this being carried out in an adjoining province, where there are many of these fattening establishments. In order to bring the two classes together, markets have been established, usually held once or twice a week, at which the producers and others bring lean fowls for sale. These markets are attended by the fatteners, who can purchase birds in considerable quantities, and thus, without any undue multiplication of middlemen, the breeder and fatterer are brought into direct relationship. The area over which the fowls are drawn is very considerable. To some extent the same system is carried out in France. It is estimated that some 600,000 or 700,000 chickens are sold annually in the town of Houdan, which is a great centre for poultry-breeding. But there we find a difference from Belgium, in that the fattening establishments are to a large extent in the same districts. At the same time, the system of markets is preferred rather than our method of collecting by higglers.

When we compare the system prevailing in England with that noted above, it will at once be evident that our method is not nearly so satisfactory. Except in the fattening districts, where the collection is very well organized, and the whole countryside is scoured by higglers buying up birds, elsewhere traders do not obtain a sufficient supply, nor is there regularity. A buyer may go into a local market, and one week may find a great quantity of chickens, whilst the next week there may be hardly any at all. Hence the business is speculative to a considerable extent, and he must allow a good margin for profit, greater than should be the case, or would be so if he were sure of securing a proper supply, to the detriment of the producer.

What we have, therefore, to consider is whether it is not possible to adopt the system in this country.

Of course, we have markets in all directions, but these markets are very general, and buyers cannot tell what is likely to be brought forward. In one or two of the Southern counties regular sales have been instituted, and these undoubtedly serve a good purpose, but the system has not spread sufficiently to warrant buyers from the fattening establishments attending them and obtaining a commensurate supply. We must aim for something on a larger scale. Supposing in any district a market is instituted of the nature which we met with in Belgium and France, the wisest plan would be at first, at any rate, to fix these monthly or fortnightly, and to take steps for the producers to attend in large numbers with their fowls for sale. That is a distinctly better plan than the creation of another race of middlemen, because the competitive spirit will be more manifested, and any benefit accruing will go into the pockets of the producers rather than of the collector or higgler. If a market were held fortnightly, and the breeders all round set themselves to have their birds ready for the markets, they would then be able to take them in sufficient quantities, and the buyers would very speedily be able to regulate their trade, having a very clear idea as to the number that they were likely to obtain. In fact, they would come into touch with the producers, and obtain a very correct idea as to the supply during each season. Of course, in many cases the buyers would represent fatteners, and thus the prices would be distinctly better than are met with at the present time. If we take, say, the North and Midland counties of England, we find that buyers there give small prices as compared with those in many of the Southern counties, because these chickens will simply be killed and sold pretty much as they are bought, and under these circumstances the returns are not nearly so good as if the chickens are intended for fattening.

We have, therefore, to consider how this system could be carried out, and in the first instance pressure should be brought to bear upon local authorities to establish such markets. It would be some time before they would attain their full dimensions, and consequently it is difficult for private enterprise to take up the question, because there would be loss for a year or two before the market became a financial success. Public bodies, however, are justified in anticipating the future, and in expending money in the establishment of markets which are likely to become a permanent feature. In many cases present markets would be available, and only differ in that specialization would take place. For instance, if it were announced that poultry markets would be held on the first and third week of certain months of the year, and the fact well advertised to both the producers and buyers, it would in process of time be the means of bringing them together. What we require, therefore, is that some of the public bodies shall have enough

spirit and faith in the future to take a step of this kind. In Belgium it has been worked out upon rather different lines, for there the markets are to a considerable extent due to the initiative of the breeders and fatteners themselves, and failing the action of public bodies there is no reason why this should not be the case. At Houdan, in France, the market is maintained by the local authorities, and they find it by no means unprofitable in that they make a slight charge for all the produce displayed in the market, as is done in many other places.

RAILWAY RATES.

Complaints have been made, and justly, that home producers are severely handicapped by the rates charged upon the various railways. In the absence of competition, carriage is often almost prohibitive, and, as we show in the Appendix,* it costs less to bring a ton of poultry from Russia than from Devonshire. Only by combined effort on the part of producers can they hope to remedy these anomalies, which work to the advantage of the foreign producer. But there is something to be said on the other side. Where traffic is uncertain and irregular, and goods are forwarded in small quantities, rates must be higher than under the opposite conditions. If twenty persons each send one hundredweight of eggs or poultry, probably to different consignees, the labour and clerical charges must be greater than if a ton were forwarded by one

* Appendix C.

person to one place. That is business, and our object should be to combine the trade, and secure the most favoured terms. We have found that, as a rule, railway companies are willing to give special terms when they are assured of regular traffic and in sufficient quantities, though perhaps not to the extent we could wish. As examples, chickens are collected in Sussex and ducklings in Buckinghamshire, and conveyed to London at an inclusive charge of 1d. per bird, and at the same rate from Fleetwood to Manchester, in some cases baskets being provided by the railway companies. Such rates, considering the service, are reasonable, but they could only be obtained where a regular and large traffic is secured. What we require is organization of the trade, so that demand can be made for rates that will not check the development of the industry, nor play into the hands of foreign producers. Our chief complaint is that where there is no competition, rates and restrictions are frequently imposed which are not found elsewhere.

Many of the railway companies now offer special rates for small parcels of agricultural produce, particulars of which are given in the Appendix.* In this direction the Great Eastern Railway Company was the pioneer. The object is to bring producers into direct communication with consumers, and whilst deserving of encouragement, it must be recognised that the greater bulk of farm produce must pass through the ordinary trade channels and be sent in bulk.

* Appendix C.

CHAPTER XXII.

THE ECONOMICS OF POULTRY-KEEPING.

IMPORTANCE OF WATCHING EXPENDITURE—NEGLECT OF SMALL ECONOMICS—HOUSES—KEEPING BIRDS TOO LONG—
 SELLING OLD HENS—MANURE—FOOD—APPLIANCES—FEATHERS—UTILIZATION OF LAND—LABOUR—SEPARATING
 THE SEXES—KEEPING MALE BIRDS—ACCOUNTS.



N all branches of industry success depends upon careful watching of expenditure as much as in the securing of satisfactory returns for produce, and in many directions the former relatively is the more important of the two. Wherever we are dealing with an industry in which operations are upon a small scale, it is very easy to make expenditure greater than receipts, though the same may be equally true in larger concerns. But with these latter the margin is usually greater. It is the simplest thing in the world to spend money, and perhaps one of the pleasantest. But we have to learn to spend where it is necessary, and to avoid any expenditure which will not bring adequate return. Sometimes the truest economy is to add largely to the debit side of our ledger. One of the most successful poultry breeders we know once gave a hundred guineas for a single bird, and he afterwards said that it was the best investment he ever made. The stock thus secured sold for high prices, and insured him the premier position in the breed. If we could tell how much stock he afterwards sold and how many prizes he won, it would be seen how justifiable was his action, which at the time savoured of recklessness. And what was true in his case is equally so, but perhaps to a lesser degree, in that of many others. Of course, in the hands of not a few breeders, such a bird would have represented the loss of £100. Not only must we have the money to spend, but the knowledge and judgment necessary to use it aright. Money is not everything. We know of another case where a man spent nearly £1,500 in high-class poultry, thinking he had only to buy the best exhibition stock in order to attain a handsome profit. But he was lacking in skill and experience, and at the end of three years, when he cleared out, his loss totalled up to more than four figures.

It is not, however, in the way of great expenditure that many poultry-keepers fail to attain that measure of success which is within their grasp, but rather in the neglect of small economics which steadily tap their

possible profits. Such leakages, small in themselves, make a formidable total in the aggregate, and it is these which need to be carefully watched. They can best be defined by the term "waste." That brings no return, and often entails greater loss than is represented by the immediate depletion of cash. Capital expenditure is necessary for our operations, and when wisely made is in itself an economy, but waste can never be economical.

HOUSES.

Good houses are a necessity, and it is generally cheaper in the long-run to spend more at the outset on well-made erections which will last a considerable time than to buy or erect those flimsy poultry-houses which are only too common. Built of thin deals, roughly put together, and weak in framework, they fail to give the protection needed for the inmates, who consequently do not lay nearly as well as would otherwise have been the case; they also cost as much in repairs and maintenance within the first two or three years as would have secured a substantial structure. A low-priced house is seldom cheap, and should be avoided by the poultry-keeper. But, on the other hand, too elaborate buildings are a mistake. It is unfair to expect the poultry to pay for them. They ought to be charged to the owner as an additional expense not needed except as a source of pleasure. One breeder we know so far recognised the fact that in laying out a new poultry yard he only booked what were necessary expenses, paying all cost of elaboration and ornamentation out of his pocket because these were a concession to his desire for an attractive place, in the same way as no one would think of expecting a percentage upon, say, a conservatory costing £1,000. No horticulturist would undertake his business with the dead weight of such a useless capital upon his operations.

Economics in houses are not alone covered by first cost, but also by the keeping of the buildings in good repair. Small renewals should be made as they are required, often avoiding the need for larger outlay.

"A stitch in time saves nine." How often do we find that five minutes' labour, not given at the proper moment, involves a considerable loss! The catch of a door becomes loose, a screw will make it perfect again; neglected, the door is blown back and the hinges snapped, perhaps the door broken. A hole in the netting can be put right in a few minutes, but left undone the birds escape, perhaps two cocks fight, and heavy loss may be the result. And so on through all the long list of avoidable casualties. Houses regularly painted or tarred will last for years, but neglected, rot sets in due to damp. Any loss which arises from neglect of these reasonable precautions is absolute waste, a reduction of profit, both immediate and in the future, to be written off as we should a bad debt, but, like the latter, not to be regarded as sunk capital or necessary current expenditure needed for carrying on our work.

KEEPING BIRDS TOO LONG.

No fowl should be kept a day longer than is required or is profitable to the owner, and yet this is a very common mistake, especially among smaller poultry-keepers. It is becoming more realized than was formerly the case that hens as layers should not be kept beyond their second laying season, but ought to be sold prior to their second moult, if we make egg-production our chief object. But very few, indeed, carry this out. There is a general feeling that it is a pity to sell a hen whilst she is laying, and thus, instead of disposing of her in June or July, when prices for old birds are good, the fowls are kept. When they fall into moult, they at once lose much of their value, and yet are consuming food all the time, and have ultimately to be sold at low prices, whilst in the meantime they are occupying space that would be better employed for the year-old birds and for the growing chickens. If we put into parallel columns the result of this neglect, it will be seen how serious is the loss. Supposing that anyone has 100 hens, half of which are yearlings and half two years old, and the latter are to be sold in June or July they will generally realize 2s. 3d. to 2s. 6d. each; in October, 1s. to 1s. 3d.

<i>Sold in July.</i>		<i>Sold in October.</i>	
£	s. d.	£	s. d.
50 hens at 2s. 3d.	5 12 6	50 hens at 1s. 3d.	3 2 6
		Less 12 weeks'	
		food at 1d. per	
		head per week	2 10 0
			0 12 6
		Plus, say, 12 eggs	
		each, at 12 for a 1s.	2 10 0
			3 2 6
Loss	... 2 10 0		

Thus it will be seen that, as a result of keeping the birds too long, the net receipts are £2 10s. less than would have been the case had they been sold off earlier, whilst there is the fact that their room would have been better than their company. The same conditions apply with young stock. Such as are not intended to be kept for stock purposes, or as layers, should be sold as soon as they have arrived at the stage when they can be most profitably turned into money, and, as a rule, that will be by the time they reach twelve to fourteen weeks. Keeping longer means so much food consumed, and very often lower prices, so that the candle of profit is being burnt at both extremities. Of course, these remarks apply principally to those who are breeding birds either to kill as chickens or to keep as layers. In the former case, there is less likelihood of keeping too long when once the market requirements are understood; but with the latter it is only too often found that the surplus birds are kept far too long, and instead of being turned into money rapidly, when they would have given a handsome return on their cost, they are eating their heads off, reducing the total profit instead of adding thereto. Some poultry-breeders have a considerable trade in selling stock birds of both sexes during the autumn, and they must keep the birds, but what is necessary in their case is mistaken policy with others. Even with them judgment is required to avoid waste of food and of space, and it is better to get rid of them than to keep a doubtful bird.

SELLING OLD HENS.

"It is easy enough to sell young chickens, but what about the old hens?" is a problem often presented for solution. At first it may seem to be a difficulty, but that is not the case in reality. At certain seasons of the year there is a good demand for these hens, and at fair prices, principally for use by Jews. Wherever a Hebrew colony is found, there a trade can be done in this direction; but it must be borne in mind that the birds have to be killed by the Kosher butchers, and must not be sent forward dead, as is the case with fowls for Gentile consumption. In London there is a regular market. Various salesmen make a speciality of the trade, and they are on the look-out for suitable birds.

When the stock of poultry is properly managed, every year half the laying hens should be got rid of, their place to be taken later on by the young pullets. The best time to get rid of them is about June or the early part of July, when they will have given their spring quota of eggs, and before the market is seriously affected either by the influx of game or supplies of foreign chickens. If the business is systematized, the older birds have not fallen into the moult at the time named, and thus, having only passed through one of these annual castings of the plumage, they do not make by any means bad eating if fed up or crammed for a fortnight or three weeks. Unless they are killed then,

it is more than likely that they will have to be kept three months longer, when the prices will be considerably lower, and all the food consumed meanwhile is practically to no purpose. This may reduce the stock of layers, but the loss of a few eggs will be more than compensated by the gain on the hens as compared with keeping them longer. If they can be sold to fatteners, that will offer the best outlet, or they may be caged and fed on ground oats, fine barley-meal, or even oatmeal mixed with soured skim-milk, for at least a fortnight. Of course, we do not mean to say that these older specimens will sell for as much as chickens, but they will probably realize 1s. to 1s. 3d. more than would be the case a couple of months later, and that is an important difference. The temptation is to keep them as long as they will lay, but it should be resisted. Once the plan here suggested is adopted, it will be very easy to follow it out annually, and avoid the keeping of birds until they are three or four years old—a mistake so often made in farm poultry.

MANURE.

One of the directions in which a great amount of waste takes place is in the manure produced by the poultry. Of course, this does not apply to farms where the birds are to a large extent at liberty, for in that case the soil receives the enriching influence, which is distributed in accordance with the movements of the birds. That this influence is very considerable cannot be doubted, for there are many cases where land has been very greatly improved as a direct result of the keeping of fowls upon it, and steps should be taken to prevent any waste in this way. Where, however, the greatest amount of loss is met with is the manure produced in the houses, and unless care is taken very valuable material is either thrown away or so dealt with that its virtue evaporates. Upon a farm the wisest plan is to scatter the manure in the same way as any ordinary fertilizer, but to do this it must be kept to the right season of the year.

There are those who advocate that it should be carefully collected, dried, and kept in barrels under cover, but a better plan is to place a thick layer of fine soil upon a firm bed of earth, brick, or cement, and then layer by layer of droppings and soil, always keeping the latter uppermost. In this way the value of the manure will be completely preserved, all unpleasant odour is prevented, and the soil gradually absorbs much of the nature of the dung, until the whole is a mass of most valuable manure, ready for use at any time. In districts where fattening is carried out to a large extent, the poultry manure is sold at from 5s. to 10s. per cart load in the moist state, and it is found of great value for manuring grass land, also various kinds of roots, and for fruit growing.

The amount of manure produced by fowls is much greater than is commonly supposed. Much depends

upon the feeding. Highly-fed birds will produce a larger quantity than those which are kept under ordinary conditions, and in the former case the manure will be richer than in the latter. We have noticed that birds put up for fattening give a greater amount of manure than when at liberty, and under those conditions the nitrogen is increased. In proof of this statement may be quoted some tables showing the constituents of three lots of manure, the first from birds which had been expensively fed; the second from those whose feeding had been good, but at a much less cost than No. 1; and the third from a lot of fowls which had been kept as cheaply as possible. Here are the figures:

No. 1 (*Expensively Fed*).

	In Original State.	Dried.
Water	69·63	—
Organic substances	18·56	61·09
Inorganic substances (soluble) ...	3·59	11·83
Inorganic substances (insoluble) ...	8·22	27·08
	100·00	100·00

The constituents were:

Nitrogen	1·25	4·11
Phosphoric acid	0·97	3·18
Potash	0·47	1·56

No. 2 (*Medium Feeding*).

Water	70·87	—
Organic substances	16·75	57·50
Inorganic substances (soluble) ...	3·74	12·84
Inorganic substances (insoluble) ...	8·64	29·76
	100·00	100·00

The constituents were:

Nitrogen	0·81	2·77
Phosphoric acid	0·75	2·56
Potash	0·81	1·74

No. 3 (*Cheaply Fed*).

Water	63·06	—
Organic substances	18·56	50·24
Inorganic substances (soluble) ...	3·78	10·23
Inorganic substances (insoluble) ...	14·60	39·53
	100·00	100·00

The constituents were:

Nitrogen	0·88	2·38
Phosphoric acid	0·55	1·48
Potash	0·88	1·12

It will be apparent that the fact of drying does not necessarily alter the constituents except so far as moisture is concerned, and the increased proportions in the dried manure is explained by the absence of water, thus giving the various substances a greater relative proportion to the total bulk.

Under ordinary conditions a hen properly fed will void from 100 to 150 pounds per annum of moist manure, varying in accordance with the breed and the conditions under which it is kept. Taking the low scale of 92 pounds as an average, it will be seen that twenty-four hens will give a ton of manure in the course of twelve months. The greater portion of this will fall on the ground, but it should be remembered that the manurial value of a fowl upon farms is at least 1s. 6d. per annum, though that is seldom taken into consideration. The following table gives the constituent elements of good fowl manure :

Moisture	...	...	...	6.63
Organic matter and ammonia salts	...	...	...	20.19
Tribasic phosphate of lime	...	...	...	2.97
Magnesia, alkaline salts, etc.	...	...	...	2.63
Sand	...	...	...	12.58
				100.00
Containing nitrogen	...	...	...	1.71
Equal to ammonia	...	...	...	2.09

Dr. Voelcker, of the Royal Agricultural Society, estimates the value of moist poultry manure at £2 per ton, and dried £4 per ton. Some time ago a correspondent of the *Live Stock Journal* stated that he had proved that equal parts of dried hen manure yielded equal results to artificial fertilizers at £9 per ton. The authority just quoted recommends 1 part mineral superphosphate, 2 parts gypsum, and 3 parts moist hen manure, dried and used 8 to 10 hundredweight per acre on cultivated land. In the South-Eastern Counties large quantities of the gatherings from the fattening establishments are utilized in connection with the growing of tomatoes and other fruit, and for garden work it is very valuable.

FOOD.

In no item of expenditure is there more actual waste than food. We have often said that for every bird dying of starvation ten thousand die from over-feeding. As we have previously stated, the food supplied should be supplemental to, and not in place of, what the fowls obtain for themselves. Hence they should be encouraged to forage as much as possible. We have always refused to prescribe given quantities of food for poultry. To do so would mean in some cases too much, in others too little. Millions of wild birds live on the poultry-keepers of the United Kingdom.

In buying food economy is necessary. We generally find that farmers desire to charge more for their small grain to poultry-keepers than we can buy better quality from corn merchants. Corn and meal should be bought in sufficient quantities and at the right time. Moreover, considerable saving may be made, if any grain is cheap, by mixing with it some other food to bring it to the right ratio; and if ground is available, much in

the way of vegetables and roots can be grown for the poultry.

APPLIANCES.

The exercise of a little care in connection with appliances frequently saves a great amount of money. There can be no question that where such appliances or machines have to be kept from one season to another, and during a considerable part of the year are not used, there is great danger of neglect with regard to them. The exercise of a little precaution at the proper time prevents considerable loss and disappointment when they are wanted for use. In the case of incubators, as soon as the hatching is over the tanks should be emptied of water, carefully dried, the egg-drawers and water-trays cleaned, and cloths washed, lamps emptied of oil and wiped, and the machine packed up. By so doing it will generally be ready for use when again needed. If the water is allowed to stand in the boiler for weeks, and the precautions named above are not taken, probably it will be found out of order, maybe the tank leaking, when it is needed, which means considerable expense and loss. The same is equally true with regard to brooders. We have sometimes seen these appliances standing out in the fields throughout the winter, or in some place exposed to all the elements. Such neglect is foolish, and leads to great loss. In the case of houses, coops, etc., a little paint or tar applied at the right time keeps them in good order; and a screw here, a nail there, will often avoid unnecessary expense. In connection with poultry-keeping, as with everything else, profit does not only depend upon receipts, but also upon the avoidance of unnecessary expenditure. To those who have plenty of money, and to whom the question of profit is not serious, probably the easiest way is to take no precautions, and buy a machine whenever it is thought fit; but the majority of people cannot find success upon these lines.

FEATHERS.

The greater portion of the feathers used by the trade in this country are imported, and large quantities are received from Eastern Europe, where a greater amount of attention is paid to the requisite methods of preparation, and buyers can secure them in greater bulk. Feather merchants state that foreign goods are more dependable and of better quality, due to systematic sorting; that frequently native feathers are not clean, and no attempt is made to sterilize them, as a consequence of which they are often infested with parasites. All these points can be easily remedied if only due attention is given in the direction of care and preparation. In spite of the lessened value of home supplies resultant from the neglect mentioned above, feathers form an important item in the receipts where poultry are killed on a large scale. In the fattening districts it is generally reckoned that the feathers obtained should

pay the cost of labour for killing and plucking, and Mr. Peter Walsh realizes nearly £300 per annum in this way, thus paying his labour bill for the services named.

When plucking takes place, the feathers should be kept free from blood and dirt, and be sorted as the work proceeds. To that end three hampers should be provided, one for the wings and tails, another for the down from breasts and thighs, and a third for the back and neck feathers. By so doing they are graded quite easily. The most valuable are those from the breasts and thighs, but if it is regarded as worth the labour the third grade may be stripped and mixed with the down. The wings and tails are of small value, and frequently cannot be sold at all, in which case they are added to the manure heap. Upon larger establishments the better plan is to put each grade loosely into large thin canvas bags, forwarding to the merchants as these are filled, as the sooner they are sold the better. Where the quantity is smaller, they should be placed in canvas or paper bags, and dried three or four times in a moderate oven, with the object of killing all parasites and of drying out the blood and sap. It is an excellent plan to beat and shake them occasionally, and to keep for some time in a warm place. Hanging the bags from the roof of a kitchen is a method to be recommended. Washing in lime-water is sometimes done, but the drying is very tedious. The following are prices which can generally be obtained: Wing and tail, 1d. per pound, when they are saleable at all; chicken and turkey down feathers, 3½d. to 4d. per pound; chicken and duck feathers mixed, 8d. per pound; duck, 1s. per pound; goose, 2s. 6d. per pound.

UTILIZATION OF LAND.

It has frequently been mentioned that what is commonly known as poultry-farming—namely, the taking of land for the purpose of poultry, and keeping only fowls upon it—does not offer the same probabilities of success as when the ground can be used for other purposes as well. This is not only true in the case of poultry, but also of larger stock. As was pointed out some years ago by a well-known writer on agriculture, one of the great values of poultry-keeping on farms is that this means an added crop without displacement of anything else, which fact should ever be kept in view. By so doing we can keep a greater number of fowls than would otherwise be the case, because if we link poultry-keeping with some form of culture there is the avoidance of that danger which, perhaps, is the greatest obstacle of all, namely, tainted ground. The plant-life will utilize and turn into money the manure placed on to the soil, restoring thereto those elements which have been exhausted. The land is divided, and not thrown entirely upon one branch of the operations. Taking the case of fruit-growing, it must make

for complete success if both fruit and poultry can be on the same ground, because the poultry will supply the trees with that nutriment in the shape of manure which they require, and the trees will keep the ground sweet. On the other hand, if only one branch is taken up, all the rent will have to be charged to it; whereas by growing fruit and keeping poultry it can fairly be divided between the two. The plan we follow is to run the fowls over meadows for about nine months of the year, then removing them and cropping it for hay. By this means we enrich our crops and insure the sweetening of the land. Sometimes it is an excellent plan to feed off by sheep where poultry have been kept for some time.

LABOUR.

To the great majority of poultry-keepers the question of labour is not of pressing importance, because whatever is required is done by themselves or their families, and hence they are not faced with risk of great loss in money. It is perfectly true that unless they make suitable arrangements and have proper appliances there may be a great waste in their own labour, but this does not appear upon the balance-sheet. One of the great benefits of good appliances is that they minimize the work of those concerned. Sometimes, however, appliances add to the labour. When we find people taking up poultry-keeping who cannot do the work themselves, and have to pay for labour, it becomes a more serious question, and we believe that many failures have arisen almost entirely from this cause. But what is true in poultry-keeping is equally true in other branches. A lady or gentleman who goes in for greenhouses, or fruit culture, or dairying cannot make the same amount of profit as one who undertakes these branches herself or himself, and the more this fact is realized the better it will be for everyone concerned. Labour is very expensive, and, as a rule, labourers will not, and cannot be expected to, work in the same way as those whose payment depends entirely upon the success of their efforts. Where labour is employed, then it is most important to keep it fully and profitably engaged, and for that purpose the enterprise should be large enough to fill the time in one direction or another.

SEPARATING THE SEXES.

Whilst it is true that the majority of breeders of exhibition stock separate the sexes in their chickens at an early age, farmers and cottagers are very neglectful indeed of this matter, and, as a consequence, trouble and loss are natural results. Some time ago we were told by a large poultry-breeder, whose primary object is egg-production, that if he could be sure which of the chickens were cockerels, he would wring their necks so soon as hatched. The reason is that as soon as the sexual characteristics become apparent the cockerels begin to fight each other and bully their sisters, check-

ing their own growth and arousing instincts which are better dormant for a considerable time. It appears to us that such methods are needless, for there are two ways in which the trouble can be avoided: First, by dividing the sexes so soon as they can be distinguished. On a farm this is not at all difficult, though it may involve two houses instead of one. These should be some distance apart, and into one the cockerels can be placed, for they will live in unison if there are no members of the fair sex to quarrel about, and they will grow much more rapidly than would otherwise be the case. As a rule, however, chickens and adults are permitted to wander and roost all together, and it is surprising how little the initial principles are acted upon. We cannot too often reiterate that the same rules should be applied to poultry as to larger stock. No one would think of allowing bull and heifer calves to run in the same field after a given age, but some people never seem to realize that separation is essential for poultry. The second way of avoiding the difficulty referred to is by caponizing all cockerels not to be kept for stock purposes when they are nine or ten weeks old. Then all can be allowed to run together without the slightest fear. Here again we are only following an example set forth in larger stock. It is desirable where a large number of chickens are being bred to get rid of the males as soon as possible, because there is no advantage in keeping them. To this end they should be separated from the pullets, and when large enough fatted off for killing. It must be kept in mind that the cockerels will not grow nearly as rapidly as if they are permitted to run with their sisters.

KEEPING MALE BIRDS.

The question is often asked as to whether it is necessary to keep a male bird at other periods than

the breeding season. It may be explained that the male has no part in production of eggs, as these are formed in the ovary, and the process will begin at the right time independently of any external influence. It is a doubtful point, however, whether the commencement of laying is not accelerated if the hens are mated, but upon this no evidence is actually possible. When fowls are kept simply for egg-production, it is not necessary to keep any male birds. The only advantage found practically is that hens are sometimes quarrelsome when only with their own sex, but a cock-bird keeps them in order, and prevents trouble arising in this way.

ACCOUNTS.

It is desirable to strongly urge that complete accounts of their operations be kept by all poultry-keepers, not merely for the satisfaction of knowing whether there has been a profit or loss—though that is very desirable—but also as an inducement to economy. There are several poultry account-books sold which may be used, or a plain ruled book can be made to serve the purpose. At the beginning of the year all birds and appliances should be valued and recorded. Next, all items of receipt and expenditure should be set down regularly and methodically; then the number of eggs laid, and how they are disposed of—whether consumed, sold, used for sitting, or for the chickens; and, finally, a hatching record, showing the dates and number of eggs set, how many hatched, and the number reared. At the year end there will have to be another valuation, and the debit side will show the valuation at the beginning of the year, and expenditure, whilst the credit side will give receipts, allowance for eggs and chickens consumed, and a final valuation. The balance between one side and the other will determine the profit or the loss, whichever has resulted.

CHAPTER XXIII.

DISEASES.

DISEASES—"PREVENTION BETTER THAN CURE"—APPETITE—INTRODUCTION OF FRESH STOCK—CLEANLINESS—DIVISION OF DISEASES—RESPIRATORY—BLOOD AND DIGESTIVE ORGANS—ZYMOTIC—NERVOUS SYSTEM—COMB AND SKIN—LIMBS—CROP AND EGG ORGANS—PARASITES—VALUE OF HOSPITAL—EGG-EATING—FEATHER-EATING—MOULTING.



HIS chapter must take the form of an *omnium gatherum*, dealing not only with the question of disease, but also with several subjects which could scarcely be included before, yet these are of great importance to all poultry-keepers, dealing as they do with those details which are essential to success.

First is the question of

DISEASES.

One of the most remarkable features of modern poultry-keeping is the great development of diseases in various forms. This is shown by the great number of questions asked in the various specialist poultry papers every week. It is true that this fact in itself would scarcely show so great an increase in disease, for at one time when a fowl was ill it either had its neck wrung or was treated with some such mixture as soot and butter, or with a dose of castor-oil. There was little or no attempt made to define the disease, to discover its nature, and thus to find a successful method of treatment; consequently the result was seldom satisfactory. It is not, therefore, to be assumed because this definition of diseases has been attempted, and, through means of publicity, made known, that disease is more prevalent. But still, from careful watching of poultry matters for many years, we have little doubt that there has been a great development of disease.

It is not a very pleasant thing to think of disease being so prevalent, and too much thinking of it would not help us in egg or fowl eating. It is true that many diseases are not hereditary, and these the more prevalent. But there are many diseases which are hereditary, and we are by no means certain what effect upon the human frame eggs from such birds have.

"PREVENTION BETTER THAN CURE."

Our object in saying this is to point out how desirable it is that fowls should be kept healthy, not only for

their own sakes, but for the sake of those who consume their produce. We do not say much about the birds themselves, as they are always cooked before eaten, and if there were any apparent disease they would be rejected. It is quite true some diseases would not have their injurious effect destroyed by cooking, but these are very seldom met with in poultry. Only seldom has there been a poultry epidemic, and it is this form of disease that would be most to fear.

The first care should be to select perfectly healthy birds for breeders. No matter how good a bird may be (and this applies equally to cocks and hens) in other respects, unless it is sound and healthy it should not be used for breeding. The temptation to neglect this is greatest amongst fancy poultry, but there is no excuse for it whatever with fowls kept for economic reasons. With them stamina is of the first consideration, and we advise the killing of those birds which show the slightest taint of any disease that is chronic in its nature. Of course, it would be folly to destroy a good hen because she had a bad cold or a touch of indigestion. These can be cured, and are not structural in their effect. But when there are signs of actual disease of lungs, or liver, or other vital organs, or if the blood is impure, then as a mere matter of pecuniary interest to kill is the cheapest as well as the best method.

The vast majority of diseases in poultry are due to bad management, which may be divided into four sections: (1) Bad housing, including cold, damp and ill-ventilated houses; (2) overfeeding, rich feeding, and impure water; (3) want of exercise, combined with an improper system of feeding; and (4) close breeding, which results in enfeeblement of the system. Each of these four parts of management has been previously dealt with, and they should be carefully studied by every poultry-keeper. That all can be prevented is undoubted, but so long as the system of feeding on rich

food in large quantities, of keeping birds in small, ill-ventilated houses, upon foul or damp ground, is continued, so long will diseases be generated and propagated; but if healthy stock only be used for breeding, and proper attention paid to management, disease will be exceptional.

THE APPETITE.

The appetite is an unfailing guide to the state of a fowl, as it is to that of any animal. In health it should be even, regular, not capricious or fitful, varying in the frequency of its return only according to the habitual period for meals. As an indication of disease we find the appetite deficient or absent, excessive and irregular, fitful and capricious, with craving after unnatural substances, and absolute repugnance to proper food. Absence of appetite may be attributed (1) to organic derangement of the stomach or to weakened digestion, but (2) more frequently to overcharge of the stomach, or pressure of injurious or indigestible substances, even in moderate or small quantities; (3) to fevers of various kinds, which can be determined by heat of the body; and (4) to emotional or other exciting causes. Excess of appetite frequently attends nervous complaints, and is often attendant on worms in the intestines. It may also be a sign of poverty in the blood, and is usually associated under these conditions with vomiting or continued relaxation of the bowels, owing to the deficient distribution of nourishment.

INTRODUCTION OF FRESH STOCK.

In connection with this subject of disease prevention, it is most important to speak as to the introduction of fresh stock birds, by which a previously healthy poultry-yard may be decimated. Additions to the poultry-yard should be made with the greatest care, both as to the choice of birds to be introduced, so far as their breeding and characteristics are concerned, and their state of health. As to the latter consideration, it is to be pointed out that frequently a strange bird has been the means of introducing disease into a previously healthy yard—disease that has taken months to eradicate. The system adopted by careful breeders is to keep purchased fowls by themselves for two or three weeks, so that any incipient disease may have time to declare itself, and that the condition of the bird may be fully observed. The time thus apparently lost by keeping a fowl apart from the others will be well spent by the security afforded.

CLEANLINESS, ETC.

It is only necessary to mention how important is absolute cleanliness in houses, coops, and every form of appliance. Labour expended in this way will repay itself a hundredfold in preventing disease. Such preparations as Calver's carbolic preparations are invaluable, not to cover up filth, but to sweeten the atmosphere, and by killing germs prevent disease. We have

previously referred to the importance of a dust bath for all fowls, but it is desirable to mention it again.

DIVISION OF DISEASES.

The diseases of poultry may be classified under the following heads:

1. Respiratory.
2. Digestive and Blood.
3. Zymotic.
4. Nervous.
5. Comb and Skin.
6. Limbs.
7. Crop and Egg Organs.
8. Parasites.

Recent investigations in medical science have proved that disease generally results from the presence of microbes, but few of those found in poultry have yet been studied. Attention has been given to some, and we may hope that others will soon be subjected to observation. The following notes do not profess to approach the question from the medical standpoint, but embody practical experience in dealing with poultry. The ordinary poultry-keeper requires some simple remedy, or to know when it is better to kill the sufferers.

1. Diseases of the Respiratory Organs.

Catarrh.—One of the commonest diseases amongst poultry is cold in the head, or catarrh, which in some cases develops into what we know as influenza. This is the result of damp or exposure, and may be induced, as in the human subject, by an unexpected change in the weather. Generally the first symptoms are a ruffling of the feathers as if the bird felt cold, and then sneezing and running at the eyes and nostrils. If this be not dealt with, the eyes begin to swell, and unless the treatment succeeds the nostrils will become stopped up with mucus, and the eyes almost, if not entirely, closed. In this latter stage the complaint is very infectious, and even if taken early it is often difficult to prevent it affecting a whole yard. Of all things, warmth is the most essential to overcome catarrh. If kept warm there need be little trouble in conquering it during the early stages. Soft food of a nourishing nature should be given, and this may be sprinkled with pepper or ginger. If taken at the first, nothing can be better as medicine than camphor (pillules are the easiest to administer), but later on doses of homeopathic tincture of aconite is to be preferred. If the discharge from the nostrils becomes very profuse, we should recommend homeopathic tincture of arsenicum. In addition to that which is given in the form of medicine, the nostrils and eyes of the bird should be washed twice a day with warm water, in which about one-sixth of vinegar has been added.

Bronchitis.—This is a further stage of the same affection. In cases where there is an inherent weak-

ness of the lungs or chest, cold often develops into bronchitis, but we have seldom found it take this form (except there has been very great neglect) unless there is such weakness. It has been suggested that the use of unslaked lime in poultry-houses causes bronchitis, as it irritates and inflames the throat. Fortunately, simple bronchitis is not difficult to discover. It is generally indicated by a rattle in the throat and a cough. If the breathing is listened to, there will be rapid respiration discernible. Usually cold in the head is not present, and the skin is dry and hot. There is dulness, and in the majority of cases loss of appetite. If not arrested, all these symptoms increase, until the breathing can be heard some distance away from where the bird is roosting.

With bronchitis medicine is of comparatively little avail. Warmth—moist warmth—is required, for dry air aggravates the disease. Steaming the apartment or pen in which the fowl is placed is most useful, and the water should be medicated with hops, poppy-heads, or a few drops of carbolic acid. Warm, soft food must be given, and a little aromatic compound added to this. To the drinking-water may be added five drops of nitric acid, sweetened with sugar. A remedy has been introduced which can be had through any chemist. It is called *euphorbia pilulifera*, and is a vegetable remedy. Sometimes there is a form of laboured breathing which is more like asthma than bronchitis, as it is unaccompanied by any cough. It is less dangerous, and partakes more of a chronic nature. For it the *euphorbia pilulifera* should be employed, as it is equally efficacious for that form of complaint.

Consumption.—This is another development which follows neglected cold, or results from the unfavourable conditions in which fowls are sometimes kept, due to a tendency to lung weakness or a bad state of the blood. It will never arise unless there is such neglect or hereditary tendency. In the latter case the disease should be stamped out, whilst the former may be avoided by the exercise of ordinary care. The symptoms of consumption are easily discernible, and not to be mistaken. There is the pale face, the incessant hacking cough, the gradual wasting of the system, which so painfully mark this fell disease in the human subject. In spite of ample and nutritious feeding, the slow but sure decay goes on, often aggravated by rapid breathing and diarrhoea, especially in the later stages. It is quite possible to prolong life for a time by the use of nutritious food, and of such medicines as cod-liver-oil or Parrish's Food; but no cure can really be effected when once the disease has secured a hold upon the system. Better by far is it to kill off all such stock, for to breed from hens so affected might lead to serious trouble. However valuable such specimens may be, the best plan is to get rid of them forthwith.

Inflammation of the Lungs.—This disease is known also as pneumonia. Sometimes catarrh (or cold) or

bronchitis develop into what is the most immediately dangerous of all respiratory diseases, namely, inflammation of the lungs. And it may suddenly develop without any apparent preliminary warning. As in human beings, its progress is very rapid. The high temperature is like a consuming fire, and soon burns out the life unless it can be reduced. We suppose there is generally some weakness of the lungs, either permanent or temporary, to permit the existence of this state of things, but it is certain that fowls are attacked with pneumonia who have not themselves or their progenitors shown any signs whatever of chest or lung weakness. Probably keeping birds in confinement, especially if the house and run be close and not properly ventilated, tends to weaken the respiratory organs. A blow, especially on the back or chest, by which the lung is injured, may induce this disease. Amongst the exciting causes are sudden changes of temperature, exposure to cold when the state of the body is not what it ought to be, and extraordinary exertion. The symptoms differ from those of consumption in that not only is there a constant cough, but also a congregation of mucus, and, which is the most certain indication of the disease, rapid breathing with that catch in it which is ever indicative of inflammation. There is also the high temperature already spoken of, and as the disease proceeds, the breathing increases in rapidity, the mouth is filled with a sickly malodorous, slimy substance, the poor bird is huddled in a heap, and it is not long ere death comes and relieves it of its misery. When discovered, and found to be pneumonia, the first object should be to reduce the inflammation, and for this purpose there is nothing better than homeopathic tincture of aconite. This should be given every hour until the most distressing symptoms abate, when every two hours will be often enough. After six hours have passed the aconite should be alternated with bryonia. In the way of medicine it is very seldom that more than these are needed. The next object is to see that the strength is kept up, and for this a little strong beef-tea given several times a day is the very best thing. It may be varied by beaten egg, in which a few drops of brandy have been mixed. Probably when the disease is passing away there may be an attack of diarrhoea, but this need not be regarded unless much prolonged, when a dose or two of chlorodyne should be given. After the inflammation has been overcome, the system needs to be built up again by the use of Parrish's Chemical Food, and cod-liver-oil, which may be given separately or mixed. We have used with the greatest benefit as a tonic capsules of cod-liver-oil with quinine, and can recommend them as most effective, and very easily administered.

Roup.—Roup is one of the most troublesome diseases with which the poultry-keeper has to contend. It is really a combination of diseases, as it embraces a cold in the head and probably a microbe of tuberculosis. In

many instances the scrofula or stomach derangement has been previously quiescent, but cold having been induced by a sudden change in the weather or from exposure, disease is developed and takes the form of roup. Externally there are all the symptoms as in catarrh, namely running at the nostrils, sneezing, or cough, and in many instances a puffing up or swelling around the eyes, in the worst forms there being a cheesy substance below the eyelid, sometimes entirely covering up the eye. In yet other instances there is nothing but running at the nostrils to indicate the presence of roup, and the heavy, mopy appearance of the fowl. But it is very easy to distinguish between common roup and cold, for in the latter case the mucous is thickened, and together with the breath is very offensive. In order to cure the disease, it is necessary not only to get rid of the cold, which can generally be done by the treatment named for cold, and keeping in a warm place from draughts, but also to deal with the tubercles. This needs patient treatment, as it is in the blood; doses of iodide of potassium may be given, and sulphur in one form or the other. The face, eyes, nostrils, and mouth should be well washed out with solution of chlorinated soda or permanganate of potash (4 grains to 1 ounce of water). The following remedy for this disease is given in *Farm Poultry*, and has been highly spoken of: "If a chicken is troubled with roup, clean out the pus, if in the month, with a wooden spatula; if you make it bleed a little do not be alarmed. When this operation is done, wash the mouth with cotton wadding attached to a little stick of wood, saturated in peroxide of hydrogen. If a little is swallowed it will not matter, as it is a non-poisonous liquid. This done, use a little aristol, which is an odourless brown powder; drop a little^a on each sore place; repeat this operation morning and night for three days, and all will be done. Should the chicken's face be swollen, which is also roup, take a very sharp knife and cut a little incision in the swollen part of the face, squeeze the open cut slightly to try to extract the root; if it cannot be done, wash well with peroxide of hydrogen and leave the wound open. Next morning or night you will find that the core has come out. Wash well with peroxide, and the aristol powder to close it up. Should all matter not be out, even by a gentle squeeze, omit the aristol till next day."

2. Diseases of the Blood and Digestive Organs.

Indigestion.—Many fowls suffer from a form of digestive derangement which is simply indigestion, and which may be cured if treated properly. The symptoms are an indolent appearance, as if the bird were unable to exert itself; a bad, or depraved appetite, generally the former. The food is hardly touched at all, and there seems no desire for natural food. The face, if examined, has generally an unhealthy look, and the feathers lose their brilliancy. The droppings are scanty

and foetid, though there is sometimes an attack of diarrhoea. The breath is usually bad.

The first step to be taken is to give a mild aperient with a view to removing anything from the bowels or intestines, as sometimes a slight obstruction is the exciting cause. Six hours afterwards an ordinary rhubarb pill may be administered, followed by the same at an interval of two days for a week. We have also known very great good result from the use of homeopathic medicines. The right ones to use for indigestion would be, when there is apparent sickness, *nuxvomica*, and when there is a dizziness, *chamomilla*. In both cases the dose should be two drops of the No. 3 tincture, in a wineglassful of water, and a teaspoonful of this given three times a day. The food should be limited, and of the plainest nature. It is better cooked. A little green stuff may be added to the soft food, and powdered wood charcoal mixed in the food assists the cure.

Diarrhoea.—The exciting causes of this complaint are very numerous indeed, and it is impossible to enumerate them all. But, fortunately, the thing itself is so apparent that no one who takes the slightest interest in his stock can fail to discern it at once. The most frequent causes are improper feeding, cold, and presence in the intestines of some irritant. It is, however, well to note here that slight looseness, by means of which Nature sometimes corrects herself, should not be stopped. This is often the prevention of a serious disease, and the use of a strong astringent would be productive of very serious harm. We should first suggest the use of bone-meal mixed with the soft food. This is not only useful as a cure, but a great preventive of diarrhoea, especially with chickens, and it should always be mixed with the soft food given to them. Boiled rice, in which some powdered chalk has been mixed, is also very useful in the earlier stages. If neither of these is successful, stronger measures are necessary. We have been most successful with *chlorodyne*, giving two drops in a teaspoonful of water twice or thrice a day. This is usually effective in stopping the progress of the complaint. The fowl should be fed entirely on soft food, with very little green stuff after the diarrhoea has passed away.

Dysentery.—This is really an aggravated form of diarrhoea, and often follows neglect. The symptoms are the same, only in a worse degree, and the evacuations are generally tinged with blood. The first object must be to stop the discharge, and for this purpose five drops of laudanum should be given mixed with the same quantity of carbonate, twice a day. The food should be rice, well boiled, and the sufferer must be kept warm and dry. It is only fair to say that dysentery is very difficult indeed to cure.

Liver Disease.—Perhaps the most troublesome complaint—one which generally follows the use of Indian corn—and at the same time the most insidious disease

that affects fowls, is liver disease, of which there has been a very great development during the last few years. This disease assumes three forms, but the worst feature in connection with it is that it may be existent for a long time without its presence being at all suspected. Very often the first evidence is only noticed a few days before the bird succumbs, when it is seen to be rather dull and listless. The most certain sign is when the bird mopes about, and instead of having a bright red coral face, which is the best indication of health, it is rather yellowish or purple. As soon as these indications are noticed, the food should be reduced in quantity and quality, avoiding everything of a rich or fatty nature. The best things to feed on will be whole barley or wheat in small quantities. It will also be as well to give some aperient medicine, preceded by a couple of grains of calomel every other day. The object is to reduce the system at once, or the disease will speedily be aggravated. Should any of the birds die, it will be better to examine them and see if liver disease is present, which can very easily be discovered, as that organ will be soft and very easily broken, or have cheesy lumps upon it.

When the nature of the disease has been discovered, steps must be taken to prevent its development, and the poultry-breeder must try to eradicate it from his stock. As liver disease is hereditary, fowls with any suspicion of it must never be bred from. When treated in time, there is no doubt that the disease can be removed, but if neglected it becomes chronic. There are many things which can be done to prevent the birds becoming affected at all, one or two of which we have already indicated, namely, feeding and the giving of exercise. But perhaps the most prolific cause of disease is overcrowding, and consequent tainting of the ground. Of course, upon farms, where there is an abundance of room, liver disease need not be feared, unless the feeding is very bad. If suspected, any good liver pill, such as Carter's, can be used with advantage.

Anæmia.—Sometimes, but not often, fowls are affected by poverty of blood, and usually this is the result of bad conditions or of unsuitable food. The first thing is to give them plenty of fresh air and as much exercise as possible. Good, nutritious food is essential, plenty of green stuff, and doses of Freeman's Concentrated Steel Solution can be given with advantage.

Tuberculosis.—This consists of minute tubercles throughout the blood. These may remain dormant for a considerable period. There are few means of discovering the process of development, for, as a rule, little or nothing is known until the trouble is fast running its course to a fatal issue. In this way it is the progenitor of consumption, liver disease, roup, canker, skin diseases in various forms, and of many other complaints. In each of these cases the tubercles find a weak spot and there deposit themselves. The causes

are many. The tendency is undoubtedly hereditary. Predisposing causes are impure air, resulting from want of ventilation in the poultry-houses, uncleanness, wrong feeding, the giving of rich food especially acting as an inducement to the formation of tubercles in the blood.

As may well be imagined, the cure of such a disease as this is necessarily attended with very great difficulty, and we do not hesitate to say the attempt will fail in many instances. When tuberculosis pure and simple is discovered, wood charcoal, iron, phosphorus, or iodide of potassium, should be employed. These must be given in small doses, say twice a day, and the cure, if success is attained, must not be looked for very rapidly. The food must not be of a stimulating nature, and be limited in quantity. The greatest attention as to housing and sanitary arrangements is absolutely necessary, and if the place is at all damp it should be drained. But as a rule birds affected are not worth the keeping.

Worms.—Very often when birds are troubled with worms it is difficult to discover what is the matter with them; the chief, or perhaps the only, thing noticed is that they mope or hang about. When worms are present, the safest and best proof is by an examination of the droppings, in which worms will generally be seen if the bird is so troubled. The cure is, happily, not a very difficult one. The best remedy, so far as our experience goes, is capsules of turpentine, one or two of which, followed in twelve hours by a dose of castor-oil, have always been sufficient to expel the troublesome parasites from the system.

3. Zymotic Diseases.

Cholera.—One of the most dreaded of all the diseases to which fowls are subject is that known as fowl cholera, and it does not appear that any country is free from it. So serious has its ravages been upon the Continent of Europe that such great scientists as Pasteur and Koch have given a considerable amount of attention to it. In America it has at various times been epidemic, while occasionally in the United Kingdom it has swept off vast numbers of poultry. Fowls affected with cholera speedily succumb, showing all the symptoms of high fever and rapid emaciation.

The causes of this dreadful disease are many and various, and there can be no question that it is terribly contagious, the epidemic spreading like wildfire when once it has been admitted into a stock of poultry, and the chances of stopping it are very few indeed. We have known it introduced by the purchase of a fowl suffering from cholera. But the important thing for every poultry-keeper to remember is that even cholera is powerless if the birds are perfectly healthy. The causes which may be said to engender chicken cholera are foul water, rotten food, fetid earth, and impure air; in fact, those conditions which always engender disease

of one form or another. Its greatest ravages have been among very highly bred and highly fed exhibition poultry, and poor, in-bred, miserable fowls. Some French writers seem to think that the healthiest go off first, but we do not think that this opinion is borne out by the facts of the case.

So far as curative measures are concerned, unfortunately very little can be done. The period is so short, and the disease runs its course so rapidly, that the fowl is dead sometimes within a few hours, and generally within two or three days. The only really efficacious medicine is chlorodyne and carbolic acid, and upon these we should almost entirely depend. The appearance of chicken cholera should be taken as a sign that the methods of feeding or management are wrong, and attention will need to be given towards prevention of its spreading.

M. Pasteur advocated the practice of inoculation as a preventive against chicken cholera. The French savant's method of operating is a little complex, but an American writer some time ago described a very much simpler method. In this he says that a hen should be vaccinated with the cholera, and in eight days her system will be thoroughly inoculated. Then cut off her head and catch all the blood in some vessel, pouring it afterwards upon paper to dry. A half-drop of this dried blood is sufficient to vaccinate a fowl. Catch the fowl to be operated upon, and with a pin or knife make a little scratch on the thigh, just enough to draw blood. Upon this place a bit of the paper upon which the virus has dried, and let the chicken run.

Diphtheric-Roup.—This disease has at times run rampant, taking the form of an epidemic, destroying vast numbers of fowls, as it is highly contagious. It is characterized by the formation of a false membrane of the mouth and throat. It generally commences with headache in the human subject, with sickness, diarrhoea, and chilliness, and is soon followed by great prostration and the formation of dirty whitish patches on the back of the mouth, at first small, but soon coalescing so as to form a membrane whose appearance has been compared to that of "damp, dirty wash-leather." When this membrane begins to peel off there is a most offensive odour, and frequently there is inability to swallow.

Mr. F. V. Theobald has given considerable attention to this subject,* and makes the following valuable suggestions as to its prevention and treatment: "One of the most important steps to take in regard to the disease is to ensure the complete isolation of the affected bird, as the disease is highly contagious. As a rule, it appears in an epizootic form amongst poultry. This can often be prevented, however, by the immediate isolation of the patients and the application of salicylic acid to the fowls' drinking-water, which should

be very limited, and watering the ground of the poultry yard or pen with a 2 per cent. solution of sulphuric acid. About 1 pint of 10 per cent. salicylic acid (dissolved in alcohol) to an equal quantity of water should be given the fowls for drinking for some days, as the acid destroys any of the wandering germs that may possibly take up their abode in the fowl's mouth. Those that are suffering from this complaint should be at once attended to. The mouth should, as far as possible, be freed from all the growths. One form can easily be removed with two needles from the mucous membrane. The membrane under the growth will be found to be white and unhealthy; many of the parasites may remain on this; thus, touching it with a strong solution (10 per cent.) of boracic or, better still, salicylic acid should invariably be practised. The whole mouth should also be well cleaned out, the birds given only a limited quantity of water, with the salicylic acid. I have found most obstinate and advanced cases give way under this acid. In the case of those firmly-embedded growths under the tongue and upon the sides of the mouth, more difficulty will be experienced in treatment. The way I have followed, generally with success, is to paint the white spots with iodine, or by the employment of lunar caustic burn them away, at the same time dressing the spots and mouth with either boracic or salicylic acid as before. In its *early* stages the disease can be easily cured, but if once allowed to get either into the œsophagus or trachea, the case, of course, is hopeless. So long as the mouth only is invaded, the disease is amenable to the above method of treatment."

Gastritis.—This is inflammation of the stomach, and is a most dangerous disease, running its course rapidly. The causes are: over-stimulating food, poison, irritants in the stomach, or internal injuries. The symptoms are not easy to enumerate, as many of them apply equally to other diseases, but they may be stated as intense thirst, constipation, quick breathing, and prostration. To allay the inflammation, the best medicine is homeopathic tincture of aconite, which should be given four or five times a day. A little salad-oil is useful to overcome the constipation, and this may be given either in the usual way or injected. The food must be good and nutritious, and to allay the thirst lime-water and milk may be given.

Enteritis.—A large number of animals die every year from this disease, which is inflammation of the bowels. The sufferer is found to be completely prostrated, squats down with plumage ruffled and wings drooping, whilst it appears unable to keep its eyes open. There is great heat, intense thirst, and rapid breathing, whilst the evacuations are generally slimy. It runs to a rapid issue, and generally cure is doubtful. The sufferer must be kept warm, and salad-oil given to it, followed by warm milk or arrowroot. Bad conditions here, again, are the usual cause, and the external

* "Parasitic Diseases of Poultry." London: Gurney and Jackson, 1896.

symptoms are not very different to gastritis. The most noticeable is that there is an absence of retching, which is generally present with the former, and the bowels are alternately loose and constipated. The same treatment can be used, with the exception of lime-water, which should be omitted.

4. Diseases of the Nervous System.

Apoplexy.—Overfed and unduly fat birds sometimes die of apoplexy, due to an overflow of blood to the head. As a rule it is discovered too late to apply any remedy. When, however, the sufferer is yet alive, a pill compound of jalap and calomel (2 grains of each) should be administered, and again twenty-four hours afterwards. Food must be simple—soaked toasted bread, with a little lean meat, or oatmeal soaked in Zebril. When the attack has passed, tonics should be given, but care must be taken to reduce the surplus fat.

Paralysis.—Paralysis is often taken for rheumatism, though, of course, it is an entirely different disease. The causes which induce paralysis are usually two: First, injury to the spine or brain; and, second, pressure upon the spine through fatty deposits thereon. Cure in cases of paralysis may be said to be impossible, for though there may be temporary relief, there is no certainty that the disease will not actually return, as it does in nearly every instance. Besides, if it did not actually return, the bird would never be the same again, and there would be either a weakness in the limbs or a fault in the plumage. Upon no account whatever should a bird which has been attacked with paralysis be bred from. Sometimes paralysis is simply due to constipation, in which case it can be removed by a strong aperient.

Vertigo.—This is a form of nervous affection which may be regarded either as a minor kind of apoplexy or as a premonitory warning thereof, as it arises from the pressure upon the brain. It is really giddiness, for the sufferer runs round and round in a circle, and there seems to be a loss of control over muscular action. The cause is a pressure upon the brain, but not of so serious a nature, though if neglected it is likely to become so. It is a good thing to revive the bird by holding it under a stream of cold water. This has the effect of stopping the pressure in the majority of cases. As soon as the patient can swallow it should have a little brandy-and-water, followed by an aperient. The cause of vertigo is the same as in the case of apoplexy.

5. Diseases of the Comb and Skin.

White-comb.—This is generally due to overcrowding, to bad feeding, and the absence of green food. The comb becomes covered with scurf, which, if not checked, in process of time extends down the neck, and the feathers fall off. It is really a form of scurvy. When white-comb appears there should be immediate attention to the food, and a wholesome and liberal diet,

pure water, grit for the assistance of digestion, and an abundance of vegetables, should be given, with strict regard to cleanliness. A good aperient should be given two or three times, and some sulphur mixed with soft food. The comb should be anointed with a little vaseline. Afterwards the birds, when cured, should have a good tonic.

Sores.—When eruptions break out on the comb, the treatment must be chiefly internal, though the sores should be touched daily with a little olive-oil in which a few drops of carbolic acid have been mixed. The internal treatment should consist of first an aperient, and then powdered vegetable charcoal; mixed with the food being the easiest way to administer the charcoal, though made up into pills is perhaps the most effective.

Eczema.—This is one of the most ordinary forms of skin disease in all domestic animals. It has been described as “an inflammatory condition of the skin, characterized by the formation of a number of papules, which soon burst, leaving an excoriated surface. The discharge soon dries, and hard dark crusts are formed. There is always a great deal of irritation present, the result of the inflammation.” This disease is chiefly found in those fowls which are kept in close, confined runs, and are very highly bred. The disease generally declares itself in the wattles, which are covered with a number of small scabs or crusts, and have a very unpleasant appearance. There is a general dullness about the bird, which has neither spirit nor appetite. As the disease is due to a vitiated condition of the blood, mere local treatment would not be enough. A dose of some cooling medicine should be given first of all. This may be either Epsom salts or sulphate of magnesia; to be followed by pills made of these ingredients: Calomel, 2 grains; Barbadoes aloes, 8 grains; gingerine, $\frac{1}{2}$ grain. This should make three pills. The skin must be washed with a lotion made of 1 dram of carbolic acid and 6 ounces distilled water, applied frequently with a sponge. Locally there should be the application of benzoated oxide of iron twice a day, or in severe cases, when the scabs are hard and firmly attached, they may be removed, after first softening with hottish barley-water, and the parts dressed with a preparation made of oxide of zinc and olive-oil, $\frac{1}{2}$ ounce each; tincture of arnica, 2 drams; spirits of camphor, 1 dram; pure carbolic acid, 10 minims; and rose-water, 7 ounces; the whole to be applied with a feather or brush three or four times a day. The supply of vegetables or green food needs to be abundant.

Scabies.—This may perhaps be termed mange, as it is really the same as the disease of that name found in various animals. It is due to parasitical causes, and is therefore allied to the itch in human subjects. An insect burrows under the skin, and sets up a severe inflammation, attended with intense itching. The parts chiefly affected are the head and feet, these being

the bare places and where the skin is exposed. After a time the disease generally spreads to the body, and the feathers become loosened, often dropping out. No good can be done until the parasites are destroyed, which may be effected by any reliable mange lotion. Mercurial ointment or vaseline is very efficacious. The former must be carefully used, and we prefer the latter, as there is less risk of blood-poisoning from its use. Fowls affected with scabies should not be allowed to mix with other fowls, as these would in that case be certainly affected.

Scaly Legs.—Yellow-legged birds are very subject to a form of elephantiasis, to which the name of scaly legs is commonly given. There are two forms of it. The one is due to the presence of a small insect on the legs, and this kind is very contagious. The other arises from a deficiency of the oily secretion, thus causing the skin to dry up and split into divisions like scales. Both are easy of cure. For the parasitic form the remedy is, after washing the legs and scrubbing them with a nail-brush, to apply sulphur ointment or Freeman's ointment. These persevered in will effect a cure. For the other kind a preparation made of equal parts of vaseline and zinc ointment, and applied daily, will be the best remedy.

6. Diseases of the Limbs.

Leg-weakness.—Young birds, especially of the heavier varieties, are often troubled with a failure of the legs which prevents their moving about freely. Usually it takes the form of squatting on the ground by the bird. If not treated at once, the joints become stiff, the toes curl up, and when the sufferer does try to walk it can only do so on its elbows, or first leg-joints, which soon, from the friction, become enlarged, and have the skin worn off on the under side. This weakness may be caused in various ways. Very often it is simply due to a more rapid growth of the frame than the legs are able to bear, and when this is the case no one can be blamed for it, as climatic influences may have been at work that could not be foreseen. But too frequently it is the result of forcing, or of a wrong system of feeding. It is most important that in all efforts to obtain size the development of both frame and flesh should go on at the same time. In a few instances we have known leg weakness to come from keeping the young birds on wooden floors. The first step should be to cease at once the giving of all food that has the slightest tendency to increase the flesh, and to give that which will go in the direction of bone formation. It will help in case the fowl is fat if an aperient be administered, but not if it has already been reduced in bulk by the complaint. A tonic will do much to remove this. To increase the circulation the legs should be rubbed with turpentine, according to the directions given under the head of "Cramp."

Cramp.—This is also a complaint that chiefly troubles

young chickens, and it is seldom found to affect adult birds. It can at first be distinguished by a somewhat awkward walking on the part of the chickens. Toes, instead of being spread out, as is usually the case, begin to draw together, and unless steps are at once taken to remedy the trouble they become useless and the bird cannot walk. The cause of cramp is damp and want of proper exercise, the remedy for which is obvious. To cure present cases a tonic should be administered, with nutritious food, and the feet may be rubbed with turpentine after they have been soaked in warm water. Encasing them with flannel soaked in turpentine is also a good thing, but is only needed in very severe cases. When the feet are being bathed the toes should be worked gently with the hand in order to increase the circulation of the blood. If the complaint is treated early, very often the mere removal to a wooden floor for a few days will put all right, though this is generally when the chickens have been reared on a clay or heavy soil.

Rheumatism.—That which would be treated as cramp in young fowls, when found in adult birds becomes of a more serious nature. This disease is not simply cramp, though that is a part of it, but has combined with it poisoning of the blood. Cold and damp are the exciting causes, by the action of which the excreting power of the skin is checked, and some of the humours which would in an ordinary way be eliminated from the system by the process of insensible perspiration are retained, and blood-poisoning is caused. Of it there are two kinds—the acute and the chronic—the former being known by the swelling of the joints and evident pain therein, accompanied by much heat and fever. If the affected parts are touched, the bird will seem to suffer therefrom, and its pain in walking is very evident. In chronic rheumatism there is much less swelling, heat, and pain, but the latter is more continuous. The chronic form is more difficult to cure. The bird is stiffer in its gait, and walks like a decrepit old man. The treatment of rheumatism must be twofold—that is, both external and internal—the latter being specially needed to touch the affection of the blood. For this sulphur in some form is perhaps the best, and the easiest way to administer it is by mixing flowers of sulphur in the soft food. It must, however, be preceded by a mild aperient, such as part of a Seidlitz powder. If the heat is great, a dose of homeopathic tincture of aconite should be administered every two hours until the fever has been reduced. When the fever is overcome and yet the pains appear to be severe, the aconite should be replaced by belladonna. Externally the treatment is just as important. At first the limbs must be bathed in warm water, and, after having been kept therein for some time, carefully dried, and then be rubbed with arnica lotion, or with turpentine, before encasing them in flannel. In very severe attacks fomenting the limbs with a decoction made

from poppy-heads will be found effective. During rheumatism the food given should be rather stimulating, and it is a good thing to give a little meat in the food. If a cure is attempted, patience and perseverance will be needed, as recovery cannot be at all rapid.

Gout.—If there is a swollen condition of the feet, that must not be confounded with rheumatism. This has been called gout, but it is due to congestion of the bloodvessels of the feet, generally the result of want of exercise. The cure is to be found in soaking the feet in warm water, and keeping the bird off wet ground, together with plenty of exercise.

Bumble-foot.—Some varieties of fowls are very subject to an affection of the feet to which the name of bumble-foot has been given. The affection consists of a swelling on the ball of the foot, which is either in the form of a corn or an abscess. The causes are various. Sharp gravel, a cement or stone floor, will equally induce the trouble. In the former, when the foot is cut with gravel (glass or sharp stones will have the same effect), an abscess generally results. In the latter it is usually a corn. With both there is a considerable amount of pain with the inflammation set up. If the abscess is only a small one, and there is not much pus in it, the best thing will be to apply daily lunar caustic in the usual way. But if the swelling is large, with an evident gathering of pus, an incision will have to be made. After all the matter has been squeezed out—and it must all be out to effect a cure—the place should be bathed with warm water once or twice a day, and two days afterwards be touched with lunar caustic. Should it gather again, the effect of a poultice may be tried. When there is a corn in the foot, then this must be cut out, which can be done quite easily. The hole left after the removal has taken place should be touched also with caustic. In treating birds suffering from any form of bumble-foot, it is most important that they be kept on perfectly clean straw, so as to keep dirt out of the wound, or some more serious development may result. Bandaging is a very wise precaution.

7. Diseases of the Crop and Egg Organs.

Crop-bound.—This is the commonest form of crop trouble, and is generally caused by careless feeding. If green food be withheld for a time, and then given in unlimited quantities, the fowl will eat to repletion, and as the crop cannot deal with this mass of undigested food all at once, it becomes hard, and not only itself cannot pass into the stomach, but effectively bars the way for other food. This same result may be caused by feeding new grain, which, swelling in the crop, becomes a solid mass. Or, on the other hand, crop-bound is often caused by the presence of a twig, or some undigestible substance that has been swallowed by the fowl. The proof of a bound crop is purely external, but is, fortunately, very easily discernible.

Instead of the crop having a firm, close appearance—in fact, not being seen—it hangs down like a bag, and on feeling it we find that there is a lump or ball of food inside. This does not hurt until it grows very large and incommodes the bird, who often eats more than usual, for the reason that the food it is eating is not being digested, but going to increase the mass in the crop. If the trouble is discovered early, cure is comparatively easy. The first step is to pour some salad-oil or melted lard down the throat, and then to work gently the crop contents by the hand. This, if properly and effectively done, will soon cause the food and the fluid to mix, and when the mass has been well broken up, it will in the course of a few hours pass away. The length of time necessary for the operation will vary, and we have known an hour required for the purpose. Warm water may be used instead of the oil or lard, but it is not so rapid nor so effective in its action. When the mass has been got rid of, great care is required in order to prevent a recurrence of it, which would almost certainly result if food was immediately given without stint. After distension like this, the crop is naturally in a somewhat inflamed condition, and very susceptible to any strain on it. The food, therefore, for a few days should be limited in quantity, and be easily assimilated, such as sopped bread or Spratt's meal. Often a permanent distension of the crop results from neglect of this simple precaution. In about a week the bird may be put on to ordinary diet.

When the kneading process is ineffectual, then an operation becomes necessary; but no one need fear it, as it is very simple and does not require great skill. The object is to remove from the crop the mass of impermeable stuff gathered there, for unless that is removed the recovery of the bird is impossible, and it must soon die from absolute starvation. The process is to make an incision lengthwise in the upper part of the crop, about $1\frac{1}{2}$ inches in length. This should be cleanly made through the outer skin with a very sharp knife or lancet. Through the incision the contents of the crop may be removed, using for that purpose a small egg-spoon. Sometimes the mass is so hard that it cannot pass through the aperture, and in that case it must be broken up, which can be accomplished with care and patience. This mass is usually very offensive, and to remove any contaminating matter remaining the organ should be washed out with warm milk-and-water, or any weak non-poisonous disinfectant. It is also desirable to pass the finger, well pared and oiled, into the orifice, so as to be certain that there is no obstruction to the oesophagus, otherwise the whole process may have to be repeated. This done, the incision must be sewn up, and for this a small bent needle should be employed, for by it the skin can be easily gathered together, and white silk or horsehair. The inner skin should be sewn first, and then the outer,

making three stitches in each, and tying separately. The food must be limited in quantity, and as described above. No water must be given until the suture has completely healed up.

Soft-crop.—In some instances when the crop is distended there is no mass of food, and the distension is from a surcharge of water or air in the crop. This cause is difficult to determine, but probably arises from some inability on the part of this organ to perform its functions. It may arise from inflammatory action, causing excessive thirst, or from indigestion. Sometimes soft-crop is found after a bound crop has been cured. When discovered, an attempt should be made to expel the contents by holding the fowl upside down, and pressing the crop with the hands. But if this does not secure the desired effect, it then becomes necessary to puncture the crop. A coarse darning-needle will answer very well for the purpose, and the incision, when made, will not need stitching. A fowl found to be affected should be kept in a pen by itself, where it cannot obtain any food but that supplied to it, and be fed three times a day with a small quantity of toasted bread which has been soaked in Zehrill. A little water may be given, but only after each meal, and then be removed from the pen. It is advisable to acidulate the water with a few drops of nitric acid. Homeopathic tincture of nux vomica is useful for correcting this derangement.

Inflammation of the Crop.—This is a much more serious complaint, and very speedily terminates in the death of the sufferer. It is usually due to the presence of some irritant poison. The symptoms are difficult breathing, restlessness, depression, attempts to vomit, and convulsions, together with, at times, phosphoric odour from the mouth. Mr. Woodroffe Hill, to whom is due the credit of defining this disease, recommends the following treatment: Mucilaginous or albuminous fluids, such as barley-water, milk, and isinglass, or a thin solution of gum, should be freely administered after first evacuating the crop. Should phosphorus have been taken, magnesia may be given, followed by turpentine mixed in cream. Oil must not be administered. Lead is often a cause of poultry poisoning when paints are about. In this case the crop should be immediately evacuated, and half a teaspoonful of sulphate of magnesia and 5 minims of sulphuric acid, mixed in a wineglassful of water, be administered without delay. In a couple of hours 5 grains of iodide of potassium may be given in a teaspoonful of water. Afterwards feed on mucilaginous liquids. If purging commences, give a teaspoonful of castor-oil, with a grain of opium. Crude or unslaked lime is an irritant poison to fowls, producing inflammation of the throat, crop, gullet, gizzard and intestines. In this case oil should at once be administered, followed by full and frequent doses of mucilaginous or albuminous fluids.

Soft Eggs.—One of the earliest forms of derangement

of the egg organs is indicated by the laying of soft eggs. Sometimes, however, this is merely due to want of shell-forming materials, chiefly with fowls in confinement. When birds are kept in small runs and commence to lay these soft eggs, the first thing is to see whether they have sufficient calcareous materials. But if this is found to be the case, then we must look in other directions, and it will generally be discovered that over or improper feeding is the cause. The egg organs have been unduly stimulated, so that they are unable to retain the egg until coated with the shell. After the steps already indicated have been taken, if unsuccessful, laying must be checked by the withholding of food having the slightest stimulating tendency, and by the giving of an aperient. For the latter there is nothing better than a pill composed of 1 grain of calomel and $\frac{1}{2}$ grain of tartar emetic. A little iron may be given in the water as a tonic, and the food should consist of boiled rice and potatoes. We have known, however, soft-shelled eggs caused by the hen being frightened, and to prevent this the nests should always be in as quiet a place as possible. Heavy breeds are most liable to be troubled in this way. At times it is found that the presence of some irritant in the egg passages causes this trouble, and when that is so the simplest way is to try a dose of castor-oil. The difficulty is that this affection is by no means easy to discover.

Egg-bound.—Another form is when the hen is unable to lay her egg, which blocks up the oviduct. This may be caused by a contraction of the passage, or by abnormal size of the egg. The noticeable symptoms are a frequent visiting of the nest without any result, and a depression of the tail and wings, the poor bird showing evident signs of distress. If the egg is very large, the first step is to soften the vent with pure salad-oil, and, if this treatment fails, to inject an ounce of the same oil an hour afterwards. In making the injection care must be taken not to break the egg, as that would probably be fatal to the hen. In more obstinate cases good will result from the use of warm treacle, in which some chopped groundsel has been mixed. This should be given in doses of a tablespoonful at a time, at intervals of an hour, until the necessary relief has been effected. Small doses of castor-oil may be substituted, but this is not so good. In very obstinate cases the holding of the vent over a jug of boiling water, in which ten drops of iodine to a quart of water is added, so as to well steam the organ, usually gives relief. When the egg produced is of the regular size, it betokens contraction of the passage, which is more serious, as that indicates inflammation. This is dealt with in the next paragraph.

Inflammation of the Oviduct.—This affection may be due to causes already mentioned, but is also caused by the passage of a broken egg. In other instances it is due to serofulous deposits. The indications are, general feverishness with restlessness, and the shape of

the eggs voided. Mr. Tegetmeier says that the locality of the inflammation may be discovered by the state of the egg. "When the inflammation is very severe, the yolks may be expelled as they are received from the ovary, without any white or membrane; at other times the white may be expelled with the yolks, or the eggs may be imperfectly or irregularly enclosed in membrane. If the lower part of the oviduct is unduly excited, the egg is expelled before the shell has been secreted, and a soft-skinned egg results. If the inflammation extends to the middle portion, the membrane is either misshapen or incomplete, and if the whole tube is inflamed the yolks are dropped without any covering whatever." The bird affected with this disease suffers greatly. There is a continual straining, and if the vent is examined it will be found to be very high in temperature. The wings are usually dropped and the feathers ruffled. Death soon follows. Treatment depends upon the cause. Should there be any remnants of broken shell in the oviduct, the first step is to remove it. Inflammation may be reduced by the aperient mentioned under the head of soft eggs, and homeopathic tincture of aconite is useful to follow.

Prolapsus.—This is commonly known as "down behind," and is generally due to overfeeding or to excessive laying, either of which will cause muscular relaxation and debility. All stimulating food should be stopped, and the system braced by tonics. The bowel, which protrudes from the vent, should be returned thereto, and when that has been done, an astringent, such as a tablespoonful of zinc dissolved in a pint of water, of which two tablespoonfuls should be employed at a time, a weak solution of alum, or vinegar and water, must be injected. This complaint is very apt to return, especially during the laying season.

8. Parasites.

Information with regard to the various forms of minute life which live upon our larger animals is always very welcome indeed, and there can be no doubt that much more injury is caused to fowls by the presence of parasites than is usually supposed. These pests swarm in many poultry-houses, even when their presence is unsuspected, and they only make their appearance when the birds are roosting during the night. The result is seen in various directions—sometimes birds failing to thrive when they apparently should do so, and in other cases different diseases being induced. In the March, 1896, issue of the *Journal of the Board of Agriculture* appeared a valuable article dealing with "The Parasites of Poultry," by Mr. F. V. Theobald, M.A., and which has been since extended and issued in book-form.* Much of the article dealt with fleas, lice, and mites, and the following suggestions for the prevention and treatment of these pests

will be found valuable: "Infestation is always worst in dirty and neglected runs and roosts, and such are a standing danger to more cleanly neighbours. Cleanliness and freedom will always put these pests under a disadvantage—not only cleanliness of the nests, walls, and floor, but also of the ceilings and perches. To suppress these pests, the houses should be cleaned down at least twice a year with a wash made of lime, sulphur, and soft-soap, the ceilings, walls, and nests having a good coating. The wash should be fairly liquid, so as to run into every crack and crevice. Early spring and autumn are the times for these applications. The perches are best treated with boiling water and soft-soap, or with an emulsion of kerosene or creosote. This latter insecticide is most beneficial, especially in regard to mites.

"Special attention should be paid to the nests; they should be frequently cleaned and changed to keep off fleas and other parasites. Neither nest-boxes nor perches should be fixed; relays of each should be at hand, so that they can be changed to ensure complete disinfection. The nest-boxes should be now and then cleaned out, and dressed with hot lime and sulphur, or with a solution of corrosive sublimate. Either dusting the prepared nests with Persian insect powder or putting a little sawdust or sand soaked in naphthaline at the bottom will keep off these depredators. Wood-shavings or wood-wool in the nests instead of straw is most beneficial. No lice or fleas will live in it, owing to the aromatic odour given off from the wood. Care, of course, must be taken that the remedies employed do not affect the eggs in the nest.

"Schneider's suggestion of fumigating the roost with sulphuret of carbon, put in small phials in the corners of the houses, etc., where they cannot be upset, is very successful so far as killing the pests goes, but this method is not quite safe to recommend. Regarding the infestation of the birds themselves, white precipitate seldom fails. The heads and necks of young chicks should be early dressed very sparingly, and repeated when necessary. White precipitate is a strong irritant poison, and needs the greatest care in its use, especially in young chicks. It is best obtained as an ointment from the chemists. Hens selected for sitting should have a small quantity of this ointment rubbed in under the vent, head, and sides, and then be well dusted with insect powder. Sitting hens are greatly tortured by parasites, and their young are often lost by neglect of these simple precautions. The skin should be first moistened with soft-soap and water prior to dusting the birds with insect powder (pyrethrum). Some breeders prefer flowers of sulphur. Dust-baths are the natural remedy for lice and mites, and fowls should never be kept without them. Sand mixed with a small quantity of creosote will generally keep the birds free from vermin. Finely-divided gypsum mixed with a small quantity of paraffin or carbolic is still

* "The Parasitic Diseases of Poultry," by F. V. Theobald, M.A., F.E.S. London: Gurney and Jackson.

more successful for these dust-baths, quickly getting rid of any lingering pests that the birds cannot reach."

Gapes.—At one time gapes was a great scourge in poultry-yards, the worms which are the cause lodging in the throats of the chickens, and destroying thousands every year. Ground which has been used for poultry for a long time is often affected, and in that case they must be removed elsewhere. Now, however, the disease has been studied, and can be overcome. But it will return unless fresh ground is provided, or chemically treated with lime to kill the germs. Several preparations have been introduced which effect a cure. These are Chamberlin and Smith's Kalyde, Freemans' Gape Powder, and Spratt's Patent Gape Remedy. The two former are volatile powders, and are administered by blowing into the air, so that as the chicks breathe the worms lose their hold and are coughed up. An excellent preventive of gapes is by anointing the heads of young birds with a preparation made as follows: Mercurial ointment, 1 ounce; pure lard, 1 ounce; flowers of sulphur, $\frac{1}{2}$ ounce; crude petroleum, $\frac{1}{2}$ ounce. This is mixed and applied.*

VALUE OF HOSPITAL.

It is an excellent plan in all extensive poultry-yards to have a room or building prepared where sick birds can be kept, not only for their own sakes, but in order to prevent spread of the disease should it prove to be infectious. Serious results are often prevented in this way. Isolation frequently means a great saving of time and money. Such remedies as have been named should be at hand, or a stock of those prepared by firms who give attention to poultry diseases, such as Spratt's Patent, London; Chamberlin and Smith, Norwich; Freemans, Birmingham, etc., will often save many pounds if applied at once.

EGG-EATING.

The cause of egg-eating is sometimes difficult to determine, but usually it is simply a bad habit. A blown egg should be filled with a strong mixture of mustard and cayenne-pepper, closing up the ends with gummed paper. Leave this in the nest, and if the hen tries to eat it she will obtain a dose she does not like, which may prove a deterrent. Sometimes the habit is due to want of shell-forming materials, a supply of which will stop the trouble. Placing the nests above ground and in a quiet place will generally prevent egg-eating.

FEATHER-EATING.

Feather-eating is one of the most annoying things that trouble the poultry-keeper, and is both difficult to account for and difficult to cure. It arises no doubt from the want of something which the hens require, and which they are able to find for themselves in a natural state, for fowls with a wide range never show it. The want may be lime, or flesh food, such as

worms and grubs, or the habit may be encouraged by the presence of insects in the feathers, which latter is best prevented by a dust-bath. Those hens which are usually the culprits had better be removed at once, as the habit will scarcely be broken off if kept with the cock. Pluck the stumps of the feathers out of the cock, and wash the bare places well; then rub on vaseline or olive-oil, mixed with a tenth part of carbolic acid. Give the birds plenty of exercise by burying the corn and letting them work for it, and also hang a piece of meat or a cabbage by a string just where they can touch it, and so that it will swing about. Some bone-meal should also be given in the soft food.

Mr. Theobald says that feather-eating, which is known as specially troublesome when birds are kept in confinement, is due to a minute parasitic mite (*Sarcoptes laevis*) on the roots of the feathers, and this observation confirms experience in many directions. Mr. Theobald, however, makes light of the fact that it is sometimes due to want of something better to do. Whilst doubtless a great majority of feather-eaters are so induced by parasites, many poultry-keepers can bear out the statement that the example of one feather-eater in a lot of birds will do more for the development of this troublesome habit than anything else, and also that certain breeds are more given to it than others. Upon this point, however, it is needless to enlarge.

Mr. Theobald says: "There are two kinds of feather-eating, viz., 'self-feather-eating' and the eating of other birds' feathers. The former is entirely due to the mites living upon and irritating the roots of the quills, and so far as is known the latter is caused by the same *acarus*. The form on the fowls makes its appearance about April, and is most prevalent in spring and summer. The mites can be easily found amongst the white powdery matter at the base of the quill. The minute young are transmitted during copulation. The fowls pluck out the feathers to destroy the irritation caused by the mites at their base.

"Prevention and Remedies.—As the disease is contagious, isolation of the affected bird is the first step, especially if it be a cock. The mites readily yield to treatment with oil of cloves rubbed into the infected area. One part of creosote to thirty of lard or vaseline is still more successful."

MOULTING.

The moulting of birds is an operation which usually takes place every year, and is casting one set of feathers and replacing them by entirely new ones. There is a constant change of and growth in the feathers all the year round, but only during the moulting season is there anything like regularity in the process. Moulting makes a considerable demand upon the system. Chickens hatched during the first four or five months of the year obtain their adult plumage about September

* See Appendix E.

or October, but this cannot be called a moult, and the first one takes place about the following September. Every year this becomes later and more protracted. Hence the plan we have advocated for laying fowls, namely, killing off birds before their first or second moult, when they are still good for table purposes, and before they have to be kept without any profit.

The time during which birds are moulting is a somewhat critical period, its nature depending very much upon the stamina and constitution of the breed. There is a considerable amount of difference in the way which the various breeds come through the moult. Some of the hardier varieties pass through it both rapidly and easily, whilst others find it most protracted and difficult. The usual period of moulting for a strong bird in its first or second year is six to eight weeks, in which

time the old feathers are completely cast, and new ones take their place; but it is no uncommon thing to find weak or old birds taking three months, with the result that winter arrives before they get through it, and they do not recommence laying until the following spring, so that several months are lost, and just when the produce is most valuable. All that is necessary for healthy birds is to give warm food once a day, mixing in it some seasoning-powder, such as Ovum, and lean meat, with a little grain, as buckwheat and hempseed, in the middle of the day. In the drinking water put a little sulphate of iron and sulphuric acid, say two pieces of the former, the size of nuts, and ten drops of the latter to a gallon of water, and, of course, this must be renewed every day, as fresh water is most important.

APPENDICES.

A.—CONSUMPTION OF POULTRY PRODUCE.



THE following are estimates of the eggs and poultry consumed in Great Britain in 1905. Ireland is not included, as it is an exporting country.

VALUES.

	Eggs.	Poultry.	Totals.
British produce	£4,700,000	£2,750,000	£7,450,000
Irish produce ...	1,950,000	450,000	2,400,000
Foreign and colonial produce	6,812,476	906,391	7,718,867
	£13,462,476	£4 106,391	£17,568,867

ESTIMATED NUMBER OF EGGS CONSUMED, 1905.

British produce	...	1,300,000,000
Irish produce ...	...	625,000,000
Foreign and colonial produce	...	2,257,711,320
		4,182,711,320

ESTIMATED WEIGHTS OF EGGS AND FOWLS CONSUMED, 1905.

Eggs ...	...	250,000 tons.
Poultry ...	...	65,000 „
Totals	...	315,000 tons.

B.—IMPORTS OF EGGS AND POULTRY.

It is interesting to show the rapid rise in the imports of these two products from abroad since 1864, and as this is largely a question of money, we confine the sub-joined table to the values, as these are fairly representative of the quantities, though there have been variations in the prices of the respective products.

VALUES OF IMPORTS.

	Eggs.	Poultry and Game.
	£	£
1864 ...	835,028	
1870 ...	1,105,653	
1875 ...	2,559,860	
1880 ...	2,335,451	
1885 ...	2,931,237	
1890 ...	3,428,802	497,858
1895 ...	4,003,440	605,166
1900 ...	5,406,141	1,010,327
1905 ...	6,812,476	906,391*

* Poultry only.

These figures show that the imports of eggs alone have advanced in forty years upwards of 700 per cent., and that there is a steady increase constantly going on, drawing from the country money which might be easily earned at home. The reason why the imports of poultry and game have not been included in the above table until 1890 is that previous to 1886 rabbits were included with them. But, it may be mentioned, the total imports of poultry, game, and rabbits in 1864 only amounted to £131,179. In 1904 the poultry imports were separated from game in Annual Returns.

SOURCES OF FOREIGN SUPPLY OF EGGS.

The following table gives the sources of foreign supply in 1905, for which we are indebted to the Statistical Department of the Board of Agriculture and Fisheries:

NUMBER OF EGGS IMPORTED INTO THE UNITED
KINGDOM DURING THE YEAR 1905.

Country from which Imported.	Number in Thousands.
Russia, North	914,615
Russia, South	72
Sweden	14,001
Norway	2
Denmark	462,976
Germany	261,087
Holland	13,770
Belgium	258,354
Channel Islands	235
France	187,869
Portugal	3,848
Spain... ..	5,302
Canary Islands	14
Roumania	122
Gibraltar	1,380
Turkey, Europe	179
Turkey, Asia	1,571
Egypt	46,092
Morocco	53,292
Canada (Atlantic ports)	31,217
United States (Atlantic ports)	1,710
South Australia	2
Total	2,257,710

It must be observed in connection with the above that the returns given as to Belgium, Germany, and Italy are misleading, because the last country through which the shipments pass are credited with them, not the country of origin. Thus, as Belgium sends very few of her eggs, and Germany practically none, we must accord the amounts of these two countries to Italy, Russia, and Austro-Hungary respectively. The most striking development of late years has been in connection with Russia. In 1890 the imports were so small that no separate entry was made in the Trade and Navigation Returns, but by 1905 they had grown to £2,426,029 for eggs, and £275,043 for poultry and game. The signs are that there will be a further increase, but, happily for home producers, the quality is of a low grade.

IMPORTS OF POULTRY, 1905.

	£
Russia	275,043
Belgium	193,816
France	227,103
United States	152,033
Other countries	58,396
Total	906,391

C.—RAILWAY RATES.

FOREIGN RATES.

For the following particulars we are indebted to the courtesy of the Commercial Department of the Board of Trade:

	Eggs per Ton.	Poultry per Ton.
	s. d.	s. d.
Russia, via Riga	22 6	30 0
Italy (Milan), in truck loads ...	83 0	83 0
„ senders of 800 trucks per annum	70 0	70 0
Canada, Montreal, or Quebec ...	16 9	
United States, New York	15 9	26 3

ENGLISH RATES.

(Supplied by the respective railway companies.)

Totnes, Devon (3 ton lots) ...	25 4	30 8
Bideford, Devon (3 ton lots) ...	25 4	33 1
Spilsby, Lincs	29 4	35 3

FARM PRODUCE BY PASSENGER TRAINS.

	20 lbs. s. d.
Great Eastern Railway (from all stations to London)	0 4
Great Northern Railway (from all stations to London)	0 6
Midland Railway Company (not exceeding 50 miles)	0 6
Midland Railway Company (50 to 100 miles) ...	0 8
„ „ (100 to 200 „) ...	0 11
„ „ (above 200 „) ...	1 2
London and North-Western, same rates as Midland.	
London and South-Western, „ „	
Great Western Railway, „ „	
London, Brighton and South Coast, „ „	

(These rates include delivery, but are at owners' risk.)

D.—TEMPERATURE AND MOISTURE

(HATCHING SHED, COLLEGE POULTRY FARM, THEALE.)

The following table shows individual weeks in the months of February to July, 1903 :

Date.	Outside Temperature.		Incubator Room.	Humidity of Air.	Date.	Outside Temperature.		Incubator Room.	Humidity of Air.
	Maximum.	Minimum.				Maximum.	Minimum.		
1903.	Fahr.	Fahr.	Fahr.	Per Cent.	1903.	Fahr.	Fahr.	Fahr.	Per Cent.
Feb. 10	55°	48°	67°	68	May 10	62°	35°	62½°	62
11	55	43	64	72	11	56	43	58½	70
12	54	42	63	67	12	57	39	61	57
13	55	34	62	72	13	58	31	66	58
14	47½	32½	59	71	14	52	45	66	58
15	50	31	63	70	15	62	45	65	67
16	49	40	60	71	16	65	27	64	72
Mar. 10	48	42	60	71	June 10	82	55	70	63
11	47	25	55	75	11	59	53	67	73
12	51	27	56	70	12	57	42	61	67
13	51½	27	56	73	13	59	39	69	63
14	57	29½	59	73	14	63	40	62	67
15	57	29	57	71	15	59	40	67	73
16	69	38	59	65	16	55	47	64	67
April 10	55	33½	63	62	July 10	75	50	71	69
11	56	44½	62	62	11	89	64	72	73
12	40	33	59	66	12	88	59	71	78
13	54	29	59	66	13	70	44	62	62
14	58	29	58	62	14	65	42	65	64
15	53	36	62	57	15	65	51	67	64
16	47	25½	59	56	16	62	53	63	77

The registers are generally made between nine and ten o'clock each morning. The percentage of moisture in atmosphere is recorded in the incubator room.

E.—LEAFLETS ON DISEASES OF POULTRY

published by the Board of Agriculture and Fisheries, 4, Whitehall Place, S.W., copies of which can be obtained on application to the Secretary :

No. 57, " External Parasites of Poultry."
No. 58, " Internal Parasites of Poultry."

No. 67, " Favus in Poultry."
No. 78, " Liver Diseases of Poultry."

F.—REPORTS ON EXPERIMENTS.

The following reports have been issued by the University College, Reading, copies of which can be obtained on application to the Registrar :

June, 1904. Growth of Chickens and Cost of Rearing.
September, 1904. Cost of Growing Pullets to a Laying Age.
May, 1905. Artificial Incubation.
August, 1905. Growth of Chickens and Cost of Rearing.*
January, 1906. The Rearing and Feeding of Turkeys.

* Contains a full list of mixtures employed in the dry feeding of Chickens, referred to in Chapter xii., page 90.

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